mineral resources

Department:
Mineral Resources
REPUBLIC OF SOUTH AFRICA

Environmental Impact Assessment and Environmental Management Programme

For The

Kubu Coal Mine Project and Associated Infrastructure

Revised Submission: August 2016

SUBMITTED FOR ENVIRONMENTAL AUTHORISATIONS IN TERMS OF THE NATIONAL ENVIRONMENTAL MANAGEMENT ACT, 1998 (ACT NO. 107 OF 2008) (NEMA) AND THE NATIONAL ENVIRONMENTAL MANAGEMENT: WASTE ACT, 2008 (ACT NO. 59 OF 2008) (NEM:WA) IN RESPECT OF LISTED ACTIVITIES THAT HAVE BEEN TRIGGERED BY APPLICATIONS IN TERMS OF THE MINERAL AND PETROLEUM RESOURCES DEVELOPMENT ACT, 2002 (ACT NO. 28 of 2008) AS AMENDED (MPRDA).

NAME OF APPLICANT:	Waterberg One Coal (Pty) Ltd
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Project Name:	**Kubu Coal Mine Project and Associated Infrastructure**
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Name	**Responsibility**	**Signature**	**Date**
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IMPORTANT NOTICE

In terms of the Mineral and Petroleum Resources Development Act, 2002 (Act No. 28 of 2002) as amended (MPRDA), the Minister must grant a Prospecting or Mining Right if among others the mining "will not result in unacceptable pollution, ecological degradation or damage to the environment".

Unless an Environmental Authorisation can be granted following the evaluation of an Environmental Impact Assessment (EIA) and an Environmental Management Programme (EMP) report in terms of the National Environmental Management Act, 1998 (Act No. 107 of 1998) (NEMA), it cannot be concluded that the said activities will not result in unacceptable pollution, ecological degradation or damage to the environment.

In terms of section 16(3)(b) of the EIA Regulations, 2014, any report submitted as part of an application must be prepared in a format that may be determined by the Competent Authority and in terms of section 17 (1) (c) the Competent Authority must check whether the application has taken into account any minimum requirements applicable or instructions or guidance provided by the competent authority to the submission of applications.

It is therefore an instruction that the prescribed reports required in respect of applications for an Environmental Authorisation for listed activities triggered by an application for a right or a permit are submitted in the exact format of, and provide all the information required in terms of this template. Furthermore please be advised that failure to submit the information required in the format provided in this template will be regarded as a failure to meet the requirements of the Regulation and will lead to the Environmental Authorisation being refused.

It is furthermore an instruction that the Environmental Assessment Practitioner (EAP) must process and interpret his/her research and analysis and use the findings thereof to compile the information required herein. (Unprocessed supporting information may be attached as appendices). The EAP must ensure that the information required is placed correctly in the relevant sections of the Report, in the order, and under the provided headings as set out below, and ensure that the report is not cluttered with un-interpreted information and that it unambiguously represents the interpretation of the applicant.

OBJECTIVE OF THE ENVIRONMENTAL IMPACT ASSESSMENT PROCESS

The objective of the EIA process is to, through a consultative process: -

- determine the policy and legislative context within which the activity is located and document how the proposed activity complies with and responds to the policy and legislative context;
- describe the need and desirability of the proposed activity, including the need and desirability of the activity in the context of the preferred location;
- identify the location of the development footprint within the preferred site based on an impact and risk assessment process inclusive of cumulative impacts and a ranking process of all the identified development footprint alternatives focusing on the geographical, physical, biological, social, economic, heritage and cultural aspects of the environment;
- determine the: -
  - nature, significance, consequence, extent, duration and probability of the impacts occurring to inform identified preferred alternatives; and
  - degree to which these impacts: -
  - can be reversed;
  - may cause irreplaceable loss of resources, and
  - can be avoided, managed or mitigated.
- identify the most ideal location for the activity within the preferred site based on the lowest level of environmental sensitivity identified during the assessment;
- identify, assess, and rank the impacts the activity will impose on the preferred location through the life of the activity;
- identify suitable measures to manage, avoid or mitigate identified impacts; and
- identify residual risks that need to be managed and monitored.

EXECUTIVE SUMMARY

Introduction

Waterberg One Coal (Pty) Ltd (WOC) intends to develop an open pit coal mine on the farm Koert Louw Zyn Pan 234 LQ, located approximately 55 km northwest of the town of Lephalale in the Limpopo Province. Koert Louw Zyn Pan is 1 365 ha in extent and is located on the southern border of the Limpopo River. To develop the proposed coal mine, which will be referred to as the Kubu Coal Mine, a Mining Right Application (MRA) was submitted to the Department of Mineral Resources (DMR) in terms of the Mineral and Petroleum Resources Development Act, 2002 (Act No. 28 of 2002) (MPRDA). WOC is the current holder of a Prospecting Right issued by the DMR for Koert Louw Zyn Pan, with reference number 678/2007 PR and renewed with reference number 53/2013 PR. WOC intends to convert the Prospecting Right into a Mining Right to mine the coal reserves within the Waterberg Coalfield.

Simultaneously with the application for a Mining Right, WOC submitted an integrated application for environmental authorisation, in terms of the National Environmental Management Act, 1998 (Act No. 107 of 1998) (NEMA), and a Waste Management Licence (WML), in terms of the National Environmental Management: Waste Act, 2008 (Act No. 59 of 2008) (NEM:WA). In addition, an Integrated Water Use Licence Application (IWULA) will be submitted to the Department of Water and Sanitation (DWS) for proposed water uses in terms of Section 21 of the National Water Act, 1998 (Act No. 36 of 1998) (NWA). A technical report in the form of an Integrated Water and Waste Management Plan (IWWMP) will be compiled in support of the IWULA. The IWULA process has not commenced to date as WOC does not currently have the necessary engineering designs. Once a suitable consultant has been appointed and the respective designed completed, the IWULA process will commence.

Project Applicant

WOC is the applicant for the proposed Kubu Coal Mine. The particulars for WOC are set out in the table below.

Table I: Applicant Details

Company Name:	Waterberg One Coal (Pty) Ltd
Contact Person:	Ms Louise van den Berg-Nicolai
Physical Address:	Unit 2, Carrera House, 15 Sovereign Drive, Route 21 Corporate Office Park, Irene
Telephone:	+27 12 345 1057/ 014 940 0199
Email:	lnbicolai@boikarabelo.co.za

Environmental Consultants

Digby Wells Environmental (Digby Wells) was appointed by WOC as the independent Environmental Assessment Practitioner (EAP) to undertake the Scoping and EIA processes. The contact details for Digby Wells are set out in the table below.

Table II: Environmental Assessment Practitioner Details

Company name:	Digby Wells Environmental
Contact person:	Duncan Pettit
Physical address:	Digby Wells House, Turnberry Office Park, 48 Grosvenor Road, Bryanston, 2191
Telephone:	+27 11 789 9495
Email:	duncan.pettit@digbywells.com

Project Overview

The Waterberg Spatial Development Plan (SDF) has identified the mining zone around Steenbokpan as Potential Development Area 1 for future mining activities; Kubu Coal Mine falls within the identified mining zone and aligns with the municipality's SDF. The proposed Kubu Coal Mine coal reserve occurs within the Volksrust Formation and Vryheid Formation of the Karoo Supergroup. The proposed open pit of the Project will be approximately 364 ha and has an estimated Life of Mine (LoM) of approximately 30 years with a production rate of 14 million tonnes per annum. The depth of the coal zones ranges from 20 m below ground level (mbgl) for coal zone 11, to approximately 160 mbgl for the base of coal zone 1.

The proposed mining method will be open pit, truck and shovel method. A boxcut will be created in the southern portion of the open pit and mining cuts will be developed in a northerly direction, and from west to east. Topsoil and soft overburden will be stripped from the mining cut and the overburden will be stockpiled on the overburden dump to the south of the open pit, with the topsoil stockpiled and utilised as a berm between the north of the open pit and the 100 m wetland buffer zone. The total footprint of the open pit and infrastructure areas totals approximately 550 ha.

Overburden will be stockpiled for the first 6 years, following which concurrent rehabilitation and backfilling will commence. Overburden and discard material will be used to backfill the open pit, although a final void will remain. A Rehabilitation Plan has been compiled for Kubu Coal Mine and is included as part of this report. The Closure and Rehabilitation Plan has assumed that all infrastructure will be demolished on site following decommissioning, with the final land use to be determined in consultation with the local municipalities and affected communities.

The Run of Mine (ROM) coal will be transported by 240 tonne haul trucks from the open pit to the crushing station and ROM tip area. The crushed ROM coal will be loaded onto an overland conveyor which will transport the coal on a Free on Mine (FOM) basis to the adjacent Boikarabelo Coal Mine, owned and operated by Ledjadja Coal (Pty) Ltd; a change of ownership of the ROM coal will take place at Boikarabelo Coal Mine Plant. No beneficiation of coal will be undertaken at the proposed Kubu Coal Mine and accordingly the mine will not have a coal discard facility. The Boikarabelo Coal Mine will beneficiate the ROM coal and produce a primary product for the export market and a secondary product supplied to the local market for power generation use. The primary and secondary products will be produced at an approximate ratio of 1:1.

Project Alternatives

The mining method to be implemented at the proposed Kubu Coal Mine will be open pit, truck and shovel mining. The location of the coal zones on site range from 20 mbgl to 160 mbgl. Underground mining is generally only feasible for coal seams or zones that are greater than 40 m in depth and that have a competent roof support structure. Truck and shovel mining is the most feasible mining method as it makes use of diesel powered shovels and haul trucks. The use of a dragline is not feasible to mine the coal reserves due to the limited length of the cuts that will be mined, particularly in the northern extent of the open pit where the 100 m buffer zone restricts the open pit size. The cuts of the open pit are not suitable for the long strip mining required by draglines.

No beneficiation of ROM coal, other than crushing, will take place on Kubu Coal Mine and the crushed ROM coal will be transported to Boikarabelo Coal Mine. The use of a conveyor belt versus truck hauling was investigated to determine how the ROM coal will be transported to Boikarabelo Coal Mine. The overland conveyor route will make use of existing servitudes and access routes to limit the potential impacts associated with construction activities and site clearing. The use of the conveyor will have fewer impacts in the long term as truck hauling will result in the generation of dust emissions on the haul roads throughout the LoM.

The site layout has taken the specialist investigations into consideration, as well as I&APs' issues and concerns. The site layout has been selected based on the following motivation:

- The overburden dump is located up-gradient of the open pit and falls within the dirty water management area;
- The infrastructure and ROM tip area and crusher are located adjacent to the overburden dump, up-gradient of the open pit and within the dirty water management area;
- The open pit has been designed to take into consideration the highest value coal resource and has excluded high ecological sensitivities and wetland areas with a 100 m buffer implemented, as well as having been placed outside of the 1:100 year floodlines of the Limpopo River. The removal of the wetland areas and floodplain of the Limpopo River from the mine plan has resulted in 378 ha of coal resources being excluded from the mine plan;

- The conveyor route will follow existing servitudes to prevent unnecessary or excessive clearing and disturbance of vegetation. The length of the conveyor will be approximately 8.2 km; and
- The topsoil dumps will be located to the north of the open pit to act as a berm to prevent potential contaminants from reporting to the surrounding environment.

Baseline Environment

The proposed Kubu Coal Mine falls within the Limpopo Water Management Area 01 (WMA1) and within quaternary catchment A41E. The Limpopo River borders the northern extent of the Project area, with a meander arm tributary of the Limpopo River located within the Project site. The meander arm tributary is in the process of gradually becoming an oxbow lake. According to Ashton *et al.* (2001), the Limpopo River was a strong historical perennial system which is now a dryland river with surface flow ceasing entirely in the winter dry season (LBTPC, 2010).

Groundwater quality within the Project area has elevated concentrations of sulphates, chlorine, calcium and sodium. The elevated concentrations are naturally occurring ions in the groundwater and are associated with the Karoo aquifers and their mineralogy, as well as slow groundwater recharge. The current surface water monitoring sites around the proposed Kubu Coal Mine area are characterised by high chloride concentrations that is naturally occurring.

Wetlands cover an area of 377.97 ha of the Project area, with 92 % of the wetland area attributed to the Limpopo River floodplain. The Present Ecological Status (PES) of all non-riparian wetlands were allocated a PES of Class C, or moderately modified, and the Limpopo River floodplain was allocated a PES of Class D, or largely modified. The Ecological Importance and Sensitivity (EIS) of the wetlands was considered to be moderate to low. The wetland hydro-geomorphic (HGM) units and respective areas include:

- Floodplain wetlands (349.28 ha);
- Hillslope seepage wetlands (21.63 ha); and
- Valley bottom un-channelled wetlands (7.06 ha).

The PES of the aquatic environment of the reach of Limpopo River assessed is categorised as Class C which is moderately modified.

The topography of the Project area is relatively flat, with limited rolling crests located intermittently throughout the Project site. The proposed Kubu Coal Mine falls within the Limpopo Sweet Bushveld (Mucina and Rutherford, 2006) and consists of plains and short, open mixed thornveld. The Project site has been categorised predominantly as Critical Biodiversity Area (CBA) 1, *irreplaceable*, with the eastern and western extents categorised as CBA 2, *optimal*, areas that should be maintained in their natural state.

The ecological sensitivity of the Project area ranges from medium-low to high sensitivity, based on the fauna and flora baseline investigation. The areas associated with the tributary of the Limpopo River, namely the delineated *Ziziphus mucronata* Riparian Woodland in the north of the Project area, were determined to have a high ecological sensitivity, with the remaining areas associated with the *Acacia mellifera* Mixed Thornveld determined to have a medium-low ecological sensitivity.

Three nationally protected tree species were identified on site, including Leadwood (*Combretum imberbe)*, Camel Thorn (*Vachellia erioloba* (previously *Acacia erioloba*)) and Shepard's Tree (*Boscia albitrunca),* the latter two having being identified in the *Acacia mellifera* Mixed Thornveld. Four mammal Species of Special Concern (SSC) were previously observed in the Project area, namely the Leopard (*Panthera pardus*), White Rhinoceros *(Ceratotherium simum)*, Honey Badger (*Mellivora capensis*) and Sable Antelope (*Hippotragus niger niger)* and a total of 8 bird Species of Special Concern (SSC) were observed.

Slight depressions and crests occur within the Project area; the crests consist of carbonate, with the depressions consisting of deeper, red soil. The red soils represent the Hutton or Kimberley soil forms; the deeper soils within the Project area are predominantly Hutton soils, and are approximately 0.8 m or more in depth. The chemical and physical properties of selective soils samples indicate that the soils are characterised by naturally low phosphorus (P) levels and, thus, the soils have very low fertility.

The land capability has been determined by the soil types identified on site. The rocky areas are classified as Class VI, moderate grazing potential. Hutton soils are usually associated with moderate cultivation, although due to climatic conditions this has been reduced to Class VI as the soil capabilities will not reach their potential. The soils within the delineated wetlands and floodplain areas were classified as Class V, wetlands.

An Archaeology Impact Assessment (AIA) was undertaken by PGS in 2009 and identified more than 200 archaeological sites in the landscape, as well as two contemporary sites (but no burial grounds). Other studies undertaken by Digby Wells in the region identified 18 burial grounds, 30 historic sites and 4 more recent / contemporary sites on surrounding farms associated with the Boikarabelo Coal Mine and proposed Dalyshope Project. The study area also contains moderate to high palaeontological sensitivity and is therefore clearly located within a rich heritage landscape with great temporal depth.

There are no settlements within the Project area, although individual households do occur along the western extent of the Project site. There are gravel roads along the periphery of the Project area, as well as intermittent roads throughout the Project site. The D2286 gravel road is located 1.8 km to the south of the Project area, from which an existing gravel access road extends northwards to the Project area.

Potential Impacts

The potential environmental impacts associated with the Kubu Coal Mine are assessed to be predominantly of minor (negative) significance. However, with the implementation of the recommended mitigation measures, these potential negative impacts may be reduced to a significance of negligible (negative). The site clearing and construction activities may result in soil compaction and soil erosion which has a number of interlinking impacts. The loss of topsoil due to erosion may impact the success of the rehabilitation activities post operation. In addition, runoff from the Project site may be saturated with suspended or dissolved solids from eroded soils. The impacted runoff may flow into the water resources and impact on surface water quality, thus impacting the aquatic ecology within these systems.

The potential impacts that have been assessed to be of a moderate (negative) or major (negative) significance includes the loss of vegetation, particularly Red Data and Protected tree species *A. erioloba* and *C. imberbe*, potential damage or destruction to unidentified heritage resources, population influx and the cone of depression associated with the dewatering of the surrounding aquifers to allow for safe mining activities to be undertaken. The loss of SSC during site clearing is inevitable. The clearance of vegetation will also impact on available faunal habitat (including avifauna, bats and land-dwelling fauna) and reduce the biodiversity of the area, while encroachment and establishment of alien invasive vegetation on disturbed areas is likely. Any permits required for the clearing of protected trees will be applied for prior to the activities taking place.

The numerical model developed for the adjacent Boikarabelo Coal Mine was utilised to determine the potential drawdown impacts associated with the Kubu Coal Mine. A numerical model for Kubu Coal Mine must be developed prior to the establishment of the open pit to confirm potential impacts. The cone of depression, which was modelled based on the numerical model developed for the adjacent Boikarabelo Coal Mine, will occur due to dewatering of the open pit which is a necessity to allow for safe mining conditions. The cone of depression will lower water tables around the open pit, with the maximum extent of drawdown, based on the Boikarabelo Coal Mine numerical model, is predicted 2.8 km to the east. The drawdown will impact on groundwater users as pumping heads will increase and boreholes potentially run dry depending on their location. This impact will be more severe once the Boikarabelo Coal Mine and Kubu Coal Mine operate concurrently, however the cone of depression is not anticipated to reach the Limpopo River.

The commencement of the Kubu Coal Mine may have several positive impacts, particularly regarding the Social and Labour Plan (SLP) commitments to be undertaken by WOC. The SLP commitments will include skills upliftment and training of the local communities, prioritised employment, Local Economic Development (LED) initiatives and services and infrastructure establishment and upgrades. Employment and education have been raised as concerns by stakeholders from local communities and the commencement of the Project will aid in addressing such concerns.

In addition, there is local and global demand for coal and the Kubu Coal Mine will produce, via beneficiation at the adjacent Boikarabelo Coal Mine, 3 million tonnes of product coal for the local market and 3 million tonnes of product coal for the international market per annum. This will contribute to the local, regional and national Gross Domestic Product (GDP) through taxes and royalties. A summary of the potential impacts associated with the Project, per Project phase, is provided in the table below.

Table III: Summary of Environmental and Social Impacts

Activity	Potential Impact	Aspects Affected	Significance Prior to Mitigation	Significance Post Mitigation
Construction Phase				
Site Clearing	Fugitive dust generation deteriorating ambient air quality	Air Quality	Minor (negative)	Negligible (negative)
	Loss of topsoil as a resource	Soils	Minor (negative)	Negligible (negative)
	Loss of land capability	Soils	Minor (negative)	Minor (negative)
	Loss of vegetation, available habitats and SSC, all of which reduce biodiversity	Fauna and Flora	Moderate (negative)	Moderate (negative)
	Instream habitat modification	Aquatics	Minor (negative)	Negligible (negative)
	Siltation of surface water resources deteriorating water quality	Surface Water	Minor (negative)	Minor (negative)
	Reduction in groundwater recharge	Groundwater	Minor (negative)	Negligible (negative)
	Generation of noise impacting sensitive receptors	Noise	Negligible (negative)	Negligible (negative)
	Damage and destruction to unidentified heritage resources	Heritage Resources	Moderate (negative)	Negligible (positive)
Infrastructure Area	Fugitive dust generation deteriorating ambient air quality	Air Quality	Minor (negative)	Negligible (negative)
	Reduction in groundwater recharge	Groundwater	Minor (negative)	Negligible (negative)
	Generation of noise impacting sensitive	Noise	Negligible	Negligible

Activity	Potential Impact	Aspects Affected	Significance Prior to Mitigation	Significance Post Mitigation
	receptors		(negative)	(negative)
Topsoil Berm	Fugitive dust generation deteriorating ambient air quality	Air Quality	Minor (negative)	Negligible (negative)
	Loss of topsoil as a resource	Soils	Minor (negative)	Negligible (negative)
	Instream habitat modification	Aquatics	Minor (negative)	Negligible (negative)
	Siltation of surface water resources deteriorating water quality	Surface Water	Minor (negative)	Minor (negative)
Haul and Access Roads	Reduction in groundwater recharge	Groundwater	Minor (negative)	Negligible (negative)
Employment and Procurement	Population influx and related impacts	Socio-economic	Moderate (negative)	Moderate (negative)
	LED initiatives and economy stimulation	Socio-economic	Minor (positive)	Minor (positive)
	Skills upliftment and training	Socio-economic	Moderate (positive)	Moderate (positive)
Operational Phase				
Open Pit Mining	Fugitive dust generation deteriorating ambient air quality	Air Quality	Moderate (negative)	Minor (negative)
	Instream habitat modification	Aquatics	Minor (negative)	Negligible (negative)
	Loss of sub-surface water to wetlands and riparian zones	Wetlands	Minor (negative)	Minor (negative)
	Contamination of surface water resources	Surface Water	Minor (negative)	Minor (negative)
	Lowering of the	Groundwater	Moderate	Minor (negative)

Activity	Potential Impact	Aspects Affected	Significance Prior to Mitigation	Significance Post Mitigation
	groundwater levels due to dewatering		(negative)	
	Generation of noise impacting sensitive receptors	Noise	Negligible (negative)	Negligible (negative)
Haul and Access Roads	Fugitive dust generation deteriorating ambient air quality	Air Quality	Minor (negative)	Minor (negative)
	Alien invasive vegetation and loss of biodiversity	Fauna and Flora	Moderate (negative)	Minor (negative)
	Generation of noise impacting sensitive receptors	Noise	Negligible (negative)	Negligible (negative)
Storage of Overburden	Fugitive dust generation deteriorating ambient air quality	Air Quality	Minor (negative)	Minor (negative)
	Instream habitat modification	Aquatics	Negligible (negative)	Negligible (negative)
	Contamination of surface water resources	Surface Water	Minor (negative)	Minor (negative)
	Contaminated groundwater through seepage	Groundwater	Minor (negative)	Minor (negative)
ROM Tip Area	Fugitive dust generation deteriorating ambient air quality	Air Quality	Minor (negative)	Minor (negative)
	Instream habitat modification	Aquatics	Negligible (negative)	Negligible (negative)
	Contamination of surface water resources	Surface Water	Minor (negative)	Minor (negative)
	Contaminated groundwater through	Groundwater	Minor (negative)	Minor (negative)

Activity	Potential Impact	Aspects Affected	Significance Prior to Mitigation	Significance Post Mitigation
	seepage			
	Generation of noise impacting sensitive receptors	Noise	Negligible (negative)	Negligible (negative)
PCDs	Instream habitat modification	Aquatics	Minor (negative)	Negligible (negative)
	Contamination of surface water resources	Surface Water	Minor (negative)	Minor (negative)
	Reduction in catchment yield	Surface Water	Minor (negative)	Minor (negative)
Employment and Procurement	Local development	Socio-economic	Moderate (negative)	Moderate (positive)
	Health and safety	Socio-economic	Moderate (negative)	Minor (positive)
	Population influx and related impacts	Socio-economic	Minor (negative)	Minor (positive)
Decommissioning Phase				
Rehabilitation	Fugitive dust generation deteriorating ambient air quality	Air Quality	Minor (negative)	Negligible (negative)
	Loss of topsoil as a resource through soil compaction and erosion.	Soils	Minor (negative)	Negligible (negative)
	Alien invasive vegetation establishment.	Fauna and Flora	Moderate (negative)	Moderate (negative)
	Instream habitat modification	Aquatics	Minor (negative)	Negligible (negative)
	Siltation of surface water resources deteriorating water quality	Surface Water	Minor (negative)	Minor (negative)
	Contaminated	Groundwater	Minor (negative)	Minor (negative)

Activity	Potential Impact	Aspects Affected	Significance Prior to Mitigation	Significance Post Mitigation
	groundwater through seepage			
	Generation of noise impacting sensitive receptors	Noise	Negligible (negative)	Negligible (negative)
Infrastructure Area	Loss of topsoil as a resource through soil compaction and erosion.	Soils	Minor (negative)	Negligible (negative)
	Generation of noise impacting sensitive receptors	Noise	Negligible (negative)	Negligible (negative)
Haul and Access Roads	Loss of topsoil as a resource through soil compaction and erosion.	Soils	Minor (negative)	Negligible (negative)
Employment and Procurement	Dependency on mine and loss of jobs	Socio-economic	Minor (negative)	Minor (negative)

Approach and methodology for the Public Participation Process

A Public Participation Process (PPP) has been initiated, which is central to the investigation of environmental and social impacts, as it is important that stakeholders who are affected by or interested in the Project are given an opportunity to identify concerns and to ensure that local knowledge, needs and values are understood and taken into consideration as part of the impact assessment process. Comments made by stakeholders during the Scoping Phase were included in the Comment and Response Report (CRR) and were used to refine the scope of specialist studies that were commissioned as part of the EIA. Furthermore, comments received during the EIA phase were also included in the CRR and responses have been provided. The table below presents a summary of the PPP activities undertaken to date.

Table IV: Summary of Public Participation Process Activities to Date

Activity	Details
Identification of stakeholders	Stakeholder database which includes I&APs from various sectors of society, including directly affected and adjacent landowners, in and around the proposed Project area.
Land Claims Enquiry	The Provincial Land Claims Commissioner was informed on ***11 August***

Activity	Details
	2015, by means of a formal letter, requesting confirmation if any land claims exist on the affected properties. A response was received on 14 October 2015 stating that there is no information pertaining to land claims for the directly affected and adjacent properties.
Distribution of announcement letter and Background Information Document (BID)	BID and formal Project announcement letter with registration and comment sheet was emailed and posted to stakeholders on ***Thursday, 29 September 2015***.
Placement of newspaper advertisement	An English advertisement was in the Mogol Pos on ***Friday, 25 September 2015***.
Placement of site notices	English site notices were put up at the proposed Project site and public places on ***Thursday, 01 October 2015***. These include: ▪ Lephalale Public Library; ▪ At a local General Dealer Shop; ▪ At a local tuck shop; ▪ At a Community Hall in Steenbokpan; and ▪ On the D175 road towards Kubu Mine Site. Various points around the proposed Project area. A site notice placement map and report has been developed, indicating the various points where site notices were placed.
Announcement of Scoping Report	Announcement of availability of the Scoping Report was done is conjunction with formal announcement of the Project. Notification was emailed and posted to stakeholders on 28 September 2015. Copies of the Scoping Report for public comment were made available at: ▪ Lephalale Local Municipality Public Library; and ▪ Lesedi Village, Steenbokpan; The Scoping Report was made available on www.digbywells.com (under Public Documents) and at the Public Meeting. *(Comment period: **01 October to 06 November 2015**)*
Stakeholder meetings	The following stakeholder meetings were undertaken: ▪ A Public Meeting for all stakeholders was held on ***Thursday, 22 October 2015 at 10:00 – 12:00*** at Letsedi Lodge, Steenbokpan; ▪ Focus Group Meeting with the Lephalale Local Municipality on ***Friday, 30 October 2015 at 10:00 – 11:00***, Lephalale Local Municipality offices; and ▪ One-on-one meeting with adjacent landowner, Mr Danie Steenkamp (landowner of the farm Doornkopje 235 LQ) on ***Friday, 30 October 2015*** in Lephalale.
Announcement of updated Scoping Report	Announcement of the availability of the updated Scoping Report was emailed and posted to stakeholders together with a Registration and Comment Form on **13 November 2015**. The FSR was available on www.digbywells.com (Public Documents). *(Comment period: **16 November – 7 December 2015**)*
Obtained comments from stakeholders	Comments, issues of concern and suggestions received from stakeholders have been captured in the CRR.
Announcement of Draft	Announcement of availability of the Draft EIA Report was emailed and posted

Activity	Details
EIA and EMP Report	to stakeholders on 3 February 2016. Copies of the EIA and EMP Report for public comment were made available at: ▪ Lesedi Village, Steenbokpan; and ▪ Lephalale Local Municipality Public Library. The Draft EIA and EMP Report was made available on www.digbywells.com (under Public Documents) and at the Public Meeting. *(Comment period: **05 February 2016 to 07 March 2016**)*
Stakeholder meeting	The following stakeholder meeting was undertaken: ▪ A Public Meeting for all stakeholders was held on ***Tuesday 23 February 2016 at 10:00 – 12:00*** at Lesedi Tshukudu Thusong Centre, Steenbokpan.
Announcement of updated EIA and EMP Report	Announcement of the availability of the updated EIA and EMP Report was emailed and posted to stakeholders on **24 March 2016**. The updated EIA and EMP Report was available on www.digbywells.com (Public Documents). *(Comment period: **30 March 2016 – 19 April 2016**)*

Conclusions and Recommendations

The potential environmental impacts associated with the Kubu Coal Mine are assessed to be predominantly of minor (negative) significance which may be reduced to negligible (negative) significance with the implementation of the recommended mitigation measures. The recommended mitigation measures provided in this report have been based on the type and significance of the potential impacts that may arise due to the Project.

The impacts of significance include the loss of SSC, the dewatering impacts associated with the open pit and potential fugitive dust generation. The numerical model, based on the adjacent Boikarabelo Coal Mine, indicates that there will be no direct impact to the Limpopo River, either through drawdown impacts or contamination plumes, which is critical as the Limpopo River is a source of water for many industries and water uses within South Africa, Botswana, Zimbabwe and Mozambique. It is essential that any potential impacts to the Limpopo River are monitored and a numerical model specific to the Kubu Coal Mine must be developed prior to mining.

The loss of SSC during site clearing is inevitable; the establishment of a biodiversity action management plan[1], conservation and nursery area for protected and Red Data species will compensate for the loss of species during site clearance, as well as ensure the Project area can be successfully rehabilitated post operation.

The commencement of the Kubu Coal Mine may also have several positive impacts, particularly regarding the SLP commitments in terms of skills upliftment and training of the local communities, prioritised local employment, LED initiatives and services and infrastructure establishment. In addition, there is significant local and global demand for coal

[1] Although it is currently not deemed to be required, the need for a potential offset strategy will be determined as part of the biodiversity management plan.

and the Kubu Coal Mine will produce, via beneficiation at the adjacent Boikarabelo Coal Mine, 3 million tonnes of product coal for the local market and 3 million tonnes of product coal for the international market. This will contribute to the local, regional and national GDP through taxes and loyalties.

The EIA and EMP report was made available for public review for a period of 30 days from 5 February 2016 to 7 March 2016 and the findings of the report were disseminated at a public meeting held on 23 February 2016. All comments, concerns and issues raised by I&APs during the EIA process were recorded and formally responded to by the EAP and/or applicant and have been included in the CRR. This updated EIA and EMP report has been subsequently updated for submitted to the DMR for consideration. The IWULA process has not yet commenced due to the engineering designs still being investigated. The IWULA process will commence, along with a PPP, once the engineering designed have been completed.

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Abbreviations and Acronyms

AIA	Archaeological Impact Assessment
ASPT	Average Score Per recorded Taxon
BID	Background Information Document
CBA	Critical Biodiversity Areas
CFP	Chance Find Procedure
CR	Critically Endangered
CRR	Comment and Response Report
DEA	Department of Environmental Affairs
DMR	Department of Mineral Resources
DWS	Department of Water and Sanitation
EAP	Environmental Assessment Practitioner
EC	Electrical Conductivity
ECA	Environmental Conservation Act, 1989 (Act No. 73 of 1989)
EIA	Environmental Impact Assessment
EIS	Ecological Importance and Sensitivity
EMP	Environmental Management Programme
EN	Endangered
FEPA	Freshwater Ecosystem Priority Areas
FRAI	Fish Response Assessment Index
FOM	Free on Mine
HIA	Heritage Impact Assessment
HGM	Hydro-geomorphic
I&APs	Interested and Affected Parties

IBA	Important Bird Area
IDP	Integrated Development Plan
IHAS	Integrated Habitat Assessment System
IHIA	Intermediate Habitat Integrity Assessment
IUCN	International Union for the Conservation of Nation
IWULA	Integrated Water Use Licence Application
IWWMP	Integrated Water and Waste Management Plan
LC	Least Concern
LED	Local Economic Development
LEMA	Limpopo Environmental Management Act, 2003 (Act No. 7 of 2003)
LIHRA	Limpopo Provincial Heritage Resources Authority
LLM	Lephalale Local Municipality
LoM	Life of Mine
MAE	Mean Annual Evaporation
mamsl	Metres above mean sea level
MAP	Mean Annual Precipitation
MAR	Mean Annual Runoff
mbgl	Metres below ground level
MIRAI	Macroinvertebrate Response Assessment Index
MPRDA	Mineral and Petroleum Resources Development Act, 2002 (Act No. 28 of 2002)
MRA	Mining Right Application
NAAQS	National Ambient Air Quality Standards
NDCR	National Dust Control Regulation
NEMA	National Environmental Management Act, 1998 (Act No. 107 of 1998)

NEM:AQA	National Environmental Management: Air Quality Act, 2004 (Act No. 39 of 2004)
NEM:BA	National Environmental Management: Biodiversity Act, 2004 (Act No. 10 of 2004)
NEM:WA	National Environmental Management: Waste Act, 2008 (Act No. 59 of 2008)
NFEPA	National Freshwater Ecosystem Priority Areas
NHRA	National Heritage Resources Act, 1999 (Act No. 25 of 1999)
NID	Notification of Intent to Develop
NT	Near Threatened
NWA	National Water Act, 1998 (Act No. 36 of 1998)
PCD	Pollution Control Dam
PES	Present Ecological Status
PM	Particulate Matter
PP	Public Participation
PPP	Public Participation Process
ROM	Run of Mine
SAAQIS	South African Air Quality Information System
SAHRA	South African Heritage Resources Agency
SAHRIS	South African Heritage Resources Information Systems
SANBI	South African National Biodiversity Index
SANS	South African National Standards
SASS5	South African Scoring System version 5
SAWQG	South African Water Quality Guidelines
SDF	Spatial Development Framework
SLP	Social and Labour Plan
SMME	Small, medium and macro enterprises

SSC	Species of Special Concern
TDS	Total Dissolved Solids
TSP	Total Suspended Particles
VEGRAI	Riparian Vegetation Response Assessment Index
VU	Vulnerable
WMA	Water Management Area
WML	Waste Management Licence
WOC	Waterberg One Coal (Pty) Ltd

Part A: Scope of Assessment and Environmental Impact Assessment Report

1 Introduction

Waterberg One Coal (Pty) Ltd (WOC) intends to develop an open pit coal mine on the farm Koert Louw Zyn Pan 234 LQ, located approximately 55 km northwest of the town of Lephalale in the Limpopo Province. Koert Louw Zyn Pan is 1 365 ha in extent and is located on the southern border of the Limpopo River. To develop the proposed coal mine, which will be referred to as the Kubu Coal Mine, a Mining Right Application (MRA) was submitted to the Department of Mineral Resources (DMR) in terms of the Mineral and Petroleum Resources Development Act, 2002 (Act No. 28 of 2002) (MPRDA). WOC is the current holder of a Prospecting Right issued by the DMR for Koert Louw Zyn Pan, with reference number 678/2007 PR and renewed with reference number 53/2013 PR. WOC intends to convert the Prospecting Right into a Mining Right to mine the coal reserves within the Waterberg Coalfield. The regional and local settings for the Project are illustrated in Plan 1 and Plan 2, Appendix A, respectively.

Simultaneously with the application for a Mining Right, WOC submitted an integrated application for environmental authorisation, in terms of the National Environmental Management Act, 1998 (Act No. 107 of 1998) (NEMA), and a Waste Management Licence (WML), in terms of the National Environmental Management: Waste Act, 2008 (Act No. 59 of 2008) (NEM:WA). Although the DMR is the competent authority for the administration of applications for environmental authorisations in respect of mining activities, the applications are subject to the provisions of the Environmental Impact Assessment Regulations, 2014[2], promulgated in terms of NEMA (the EIA 2014 Regulations). Simultaneously with the publication of the EIA 2014 Regulations, the Minister of the Department of Environmental Affairs (DEA) published Listing Notice 1[3] (identifying activities that would require environmental authorisation after a Basic Assessment Process), Listing Notice 2[4] (identifying activities that would require environmental authorisation after a Scoping and Environmental Impact Assessment Process) and Listing Notice 3[5] (identifying activities within the sphere of the various provinces). Finally, the Minister of the DEA published Regulations relating to waste management activities in accordance with NEM:WA[6].

An integrated environmental authorisation and WML application was submitted in accordance with the MPRDA, read with the NEMA and in accordance with the NEMA EIA 2014 Regulations, for identified activities that require an EIA process to be undertaken. This EIA report has been compiled in support of the MRA, environmental authorisation and WML applications.

[2] GN R982 published in Government Gazette 38282 of 4 December 2014

[3] GN R983

[4] GN R984

[5] GN R985

[6] GN R921

In addition to the above, an Integrated Water Use Licence Application (IWULA) will be submitted to the Department of Water and Sanitation (DWS) for proposed water uses in terms of Section 21 of the National Water Act, 1998 (Act No. 36 of 1998) (NWA). A technical report in the form of an Integrated Water and Waste Management Plan (IWWMP) will be compiled in support of the IWULA. The IWULA process has not yet commenced and will be initiated once the respective engineering designs for the Project have been completed.

The purpose of the EIA process is to ensure that potential environmental and social impacts associated with the construction, operation and closure of a project are identified, assessed and appropriately managed. There are two primary phases of an EIA process, namely the Scoping Phase and the Impact Assessment Phase. Identification of potential impacts occurs during the Scoping Phase, with the assessment and mitigation of those impacts occurring during the Impact Assessment Phase. This EIA and Environmental Management Programme (EMP) Report presents the findings of the specialist studies undertaken as part of the EIA process, including the significance of the potential impacts and the recommended mitigation measures.

In terms of the NEMA, Interested and Affected Parties (I&APs) must be given the opportunity to comment on the proposed Project. Thus, this report aims to provide a description of the overall Project and activities, the biophysical and social environments within which the Project is being proposed and the significance of the potential impacts that the Project may have on these environments. The Scoping Report was made available for public review from 1 October 2015 to 6 November 2015, with the updated Scoping Report, which incorporated comments from I&APs, submitted to the DMR on 16 November 2015 for consideration. Furthermore, the EIA and EMP report was made available for public review and comment from 5 February 2016 to 7 March 2016. This updated EIA and EMP report includes the comments from I&APs throughout the EIA process.

2 Item 3: Project Applicant

WOC has appointed Digby Wells as the independent Environmental Assessment Practitioner (EAP) to conduct the EIA and associated specialist studies for the proposed Kubu Coal Mine Project area, as well as the required Public Participation Process (PPP).

2.1 Item 3(a)(i): Details of the EAP

Table 2-1 provides the details of the EAP for the Kubu Coal Mine Project.

Table 2-1: Contact details of the EAP

Company Name:	Digby Wells Environmental
Contact Person:	Duncan Pettit
Physical Address:	Turnberry Office Park, 48 Grosvenor Road, Bryanston, 2191
Postal Address	Private Bag X10046, Randburg, 2125
Telephone:	011 789 9495
Email:	duncan.pettit@digbywells.com

2.2 Item 3(a)(ii): Expertise of the EAP

2.2.1 The Qualifications of the EAP

Duncan Pettit is an Environmental Consultant in the Environmental and Legal Services Department at Digby Wells. Duncan obtained a BSc (Bachelor of Science) degree in Environmental Management: Zoology Stream from the University of South Africa. Proof of Duncan's qualification is included in Appendix B.

2.2.2 Summary of the EAP's Past Experience

The CV of Duncan Pettit, including the relevant project experience, is included in Appendix B. Duncan Pettit has been involved in numerous projects related to mining operations and has project managed and compiled numerous Basic Assessment (BA), Scoping and EIA and EMP reports. In addition, Duncan has undertaken performance assessments and audits to assess operations and activities compliance against its EMP, as well as compiling WULA and IWWMPs.

3 Item 3(b): Description of the Property

The property details associated with the proposed Kubu Coal Mine are presented in Table 3-1, with the conveyor route utilising existing servitudes on the farms detailed in Table 3-2.

Table 3-1: Property Details

Farm Name:	The proposed Mining Right is located on the following farm: ▪ Koert Louw Zyn Pan 234 LQ.	
Application Area (Ha):	1 365 ha.	
Magisterial District:	The proposed Kubu Coal Mine is located within the Lephalale Local Municipality (LLM) and the Waterberg Magisterial District.	
Distance and direction from nearest town:	Steenbokpan is located 17 km to the south-southeast, with Lephalale located 55 km to the east-southeast of the Project site.	
21 digit Surveyor General Code for each farm portion:	Koert Louw Zyn Pan 234 LQ	T0LQ00000000023400000

Table 3-2: Conveyor Route Details

Farm Name:	The proposed conveyor route is located on the following farms: ▪ Koert Louw Zyn Pan 234 LQ; ▪ Kalkpan 243 LQ; ▪ Draai Om 244 LQ; and ▪ Witkopje 238 LQ.	
Application Area :	8.23 km	
21 digit Surveyor General Code for each farm portion:	Koert Louw Zyn Pan 234 LQ	T0LQ00000000023400000
	Kalkpan 243 LQ	T0LQ00000000024300000
	Draai Om 244 LQ;	T0LQ00000000024400000
	Witkopje 238 LQ.	T0LQ00000000023800000

4 Item 3(c) of Appendix 3: Locality Map

A regional plan and local setting plan have been included as Plan 1 and Plan 2 respectively, within Appendix A. The nearest towns are Steenbokpan and Lephalale, located 17 km and 55 km to the south-southeast and east-southeast respectively.

5 Item 3(d) of Appendix 3: Description of the Scope of the Proposed Overall Activity

5.1 Listed and Specified Activities

5.1.1 Environmental Authorisation

The primary authorisations to consider will be an environmental authorisation to be granted in accordance with the EIA Regulations, 2014. NEMA identifies two classes of activities requiring authorisation, those of a reduced/limited nature (defined by specific and low thresholds) requiring evaluation by what is described as a Basic Assessment process, and those considered to have a substantial impact (defined by specific and higher thresholds) which require a more detailed Scoping and EIA process. In addition to the EIA Regulations, 2014 the Minister of Environmental Affairs (DEA) has published three notices identifying activities that require a BA process (Listing Notice 1 and Listing Notice 3) and a full EIA process (Listing Notice 2). The proposed Project activities have been assessed against the activities listed in the Listing Notices to determine which of the Listed Activities will be triggered. As this Project triggers activities under both Listing Notice 1 and 2, a full Scoping and EIA process has been undertaken.

The listed and specified activities for the Kubu Coal Mine are set out in Table 5-1 and include the activities' aerial extents. The mine plan for the Kubu Coal Mine is included in Plan 3, Appendix A, with the infrastructure layout illustrated in Plan 4, Appendix A.

Part 3 of Chapter 4 of the EIA Regulations, 2014, sets out the timeframe for applying for and obtaining an environmental authorisation. In brief, this requires:

- Compilation of a Scoping Report: a Scoping Report must be submitted to the competent authority within 44 days from date of submission of the application for the Environmental Authorisation (including a 30 day Scoping Report review period);
- Consideration of the Scoping Report by the competent authority: the competent authority must reach a decision on the Scoping Report within 43 days and either accepts it and directs the applicant to proceed with the EIA, or refuse it under defined circumstances;
- Preparation of the EIA: the applicant must prepare a detailed EIA and an EMP in accordance with the Scoping Report and submit it to the competent authority within 106 days after being directed to do so (including a 30 day EIA Report review period); and

- Decision on the application: the competent authority must reach a decision on the EIA and the EMP within 107 days and either grant environmental authorisation or refuse it.

5.1.2 Waste Management

The Regulations regarding the Planning and Management of Residue Stockpiles and Residue Deposits, 2015, were published on Friday 24 July 2015 in GN R632 in GG 39020. These Regulations provide the framework for the management of residue stockpiles and deposits in terms of the NEM:WA, in place of the Regulations previously in place in terms of the MPRDA. Although the DMR will remain the competent authority, residue stockpiles and residue deposits will now be governed by the new NEM:WA Regulations.

The implications in brief are as follows:

- The identification and assessment of environmental impacts arising from residue stockpiles and residue deposits must be done as part of the EIA;
- The management of residue stockpiles and residue deposits must be in accordance with any conditions and management measures in the EMP and WML;
- A risk analysis based on the identified characteristics and the classification must be used to determine the appropriate mitigation and management measures;
- Residue stockpiles and residue deposits must be characterised to identify any potential risk to health and safety, and environmental impacts that may be associated with the residue when stockpiled or deposited, in terms of its physical characteristics, chemical characteristics and mineral content; and
- The required pollution control barrier system shall be defined by the National Norms and Standards for the Assessment of Waste for Landfill Disposal and the National Norms and Standards for Disposal of Waste to Landfill.

The Regulations provide that the design of the residue stockpiles and deposits must be undertaken by a professional civil or mining engineer, an assessment of the typical soil profile on the site is required and the design of a residue stockpile and residue deposit must take into account all phases of the life cycle of the residue stockpile and residue deposit, from construction through to post closure.

The list of waste management activities that have, or are likely to have, a detrimental effect on the environment published in GN 921 in GG 37083 of 29 November 2013 have been amended in terms of GN R633 in GG 39020 of 24 July 2015 to include residue deposits and residue stockpiles. The Kubu Coal Mine will not contain a discard dump as all processing of coal will occur at the adjacent Boikarabelo Coal Mine. A WML will be required for the overburden dump, however.

Further details pertinent to the policy and legislative context of this project are set out in Section 6 of this report.

Table 5-1: Project Activities

Name of Activity	Aerial extent of the activity	Listed Activity	Applicable Listing Notice
Site Clearing (including open pit, haul and access roads, overburden dump. Infrastructure area and PCDs)	551.37 ha	Activity 15	GN R984
Drilling and blasting	Site specific	Activity 17	GN R984
Haul Roads	6.8 km	Activity 24 Activity 18	GN R983 GN R985
Access Roads	8.7 km	Not listed[7]	N/A
Overburden Dump	160.69 ha	Activity 17 Activity 4(7) Category B	GN R984 GN R921
Conveyor belt and transport of Run of Mine (ROM) coal	8.23 km	Activity 7	GN R984
ROM tip area	7.54 ha	Activity 17	GN R984
Crushing Station	7.54 ha	Activity 21	GN R984
Pollution Control Dams (PCDs)	1.63 ha	Activity 6	GN R984
Water pipelines for potable and raw water (within road servitudes)	Approximately 8 km	Activity 9	GN R983
Topsoil dump	12.23 ha	Not listed	N/A
Open pit	364 ha	Activity 17	GN R984
Drain and storm water management	4.79 km	Not listed	N/A
Development of infrastructure area including workshop, change rooms, water reservoir, operating office and security.	5.2 ha	Activity 15	GN R984

[7] Access roads to the Project site already exist. Access roads on site are expected to be less than 8 m.

Name of Activity	Aerial extent of the activity	Listed Activity	Applicable Listing Notice
Fuel Storage Area	0.075 ha	Activity 14 Activity 10	GN R983 GN R985
Waste generation, storage and disposal	Within infrastructure area	Not listed[8]	N/A
Rehabilitation of Project area	551.37 ha	Activity 22 Activity 17	GN R983 GN R984

5.2 Item 3(d)(ii): Description of the Activities to be Undertaken

5.2.1 Mineral Resource

The proposed Kubu Coal Mine coal reserve occurs within the Volksrust Formation and Vryheid Formation of the Karoo Supergroup. These formations and the respective coal zones vary in thickness between a few centimetres and 9 m. There are 11 coal zones associated with the Waterberg Coalfield, with the bottom coal zones 1 to 4 occurring within the Vryheid Formation and the upper coal zones 5 to 11 occurring in the Volksrust Formation. The coal zones of the Vryheid Formation consist of predominantly dull coals, with intercalated bright coal. The proportion of semi-soft coking coal is greatest in coal zones 6 to 11, with coal zone 6 having higher phosphorus content than coal zones 7 to 11. Coal zones 9 to 11 are characterised by bright or vitrinite coals and provide the highest yield and coal quality.

The proposed open pit of the Project will be approximately 364 ha and has an estimated Life of Mine (LoM) of approximately 30 years with a production rate of 14 million tonnes per annum of Run of Mine (ROM) coal. The depth of the coal zones ranges from 20 m below ground level (mbgl) for coal zone 11, to approximately 160 mbgl for the base of coal zone 1.

The establishment of the Kubu Coal Mine will provide approximately 1 500 temporary employment opportunities during the construction phase, and further 390 permanent employment opportunities during the LoM, resulting in economic contribution to the local work force and communities

5.2.2 Mining Method

The proposed mining method will be open pit, truck and shovel method. A boxcut will be created in the southern portion of the open pit and mining cuts will be developed in a northerly direction, and from west to east. Haul roads will allow haul trucks to access the mined areas by means of a ramp that will be located in the southwest of the open pit. Topsoil

[8] This activity refers to waste generation within the infrastructure area. Waste generated will not exceed the capacity of 100 m^3 for general waste or 80 m^3 for hazardous waste and, thus, this activity has not been triggered.

and soft overburden will be stripped from the mining cut and the overburden will be stockpiled on the overburden dump to the south of the open pit, with the topsoil stockpiled and utilised as a berm between the north of the open pit and the 100 m wetland buffer zone. Blasting activities will subsequently be applied to the hard overburden and in-between the coal zones, with the overburden also stockpiled on the overburden dump. Overburden will be stockpiled for the first 6 years, following which concurrent rehabilitation and backfilling will commence. The ROM coal will be transported by haul trucks to the crushing station and ROM tip area.

5.2.3 Mineral Processing

The ROM coal will be transported by 240 tonne haul trucks from the open pit to the crushing station and ROM tip area. The ROM coal will be crushed in a double stage crushing station and temporarily stored in a stockpile at the ROM tip area. The ROM coal will be loaded onto an overland conveyor which will transport the coal on a Free on Mine (FOM) or Free into Plant basis to the adjacent Boikarabelo Coal Mine, owned and operated by Ledjadja Coal (Pty) Ltd; the ownership of the ROM coal is transferred to Boikarabelo Coal Mine upon entry to the plant. No beneficiation of coal will be undertaken at the proposed Kubu Coal Mine. The Boikarabelo Coal Mine will beneficiate the ROM coal and produce a primary product for the international export market and a secondary product supplied to the local market for power generation use. The primary and secondary products will be produced at an approximate ratio of 1:1.

5.2.4 Infrastructure Requirements

The infrastructure layout plan is included in Plan 4, Appendix A. The Project site is currently fenced off from neighbouring farms; the fenced off areas will remain and access will be restricted to Kubu Coal Mine. The proposed infrastructure associated with the open pit activities at the Kubu Coal Mine include:

- Open pit including ramps and boxcut;
- Haul and access roads;
- Overland conveyor belt;
- Crushing station and ROM tip area;
- Overburden dump;
- Topsoil dump and berm;
- Production offices and hard-park workshops including change house;
- Fuel and explosives storage;
- Clean and dirty water management (storm water management structures), cut-off drains and berms;
- Raw and potable water pipelines; and

- PCDs for dirty water storage and water reservoirs for potable water storage.

5.2.5 Coal Transport

The ROM coal will be transported from the open pit to the crushing station and ROM tip area in the southwest of the Project area via 240 tonne haul trucks. The ROM coal will be crushed and transported via overland conveyor to the Boikarabelo Coal Mine. The conveyor route is outlined in Plan 4, Appendix A and will make use of existing servitudes and access roads. The access roads will extend north of the D2286 road towards Kubu Coal Mine, as well as entering Boikarabelo Coal Mine to the south of the D2286 road; the access routes already exist. The conveyor will be constructed under the D2286 road that separates the Boikarabelo Coal Mine and proposed Kubu Coal Mine. The conveyor will deposit the ROM coal at the raw coal stockpiles at Boikarabelo Coal Mine. A haul road will be situated alongside the conveyor to act as a service road for the conveyor, as well as providing access to Boikarabelo Coal Mine for vehicle and equipment maintenance; no vehicles or equipment will be maintained or serviced within Kubu Coal Mine.

5.2.6 Water Management

The open pit, overburden and topsoil dumps and infrastructure associated with the Kubu Coal Mine have been located away from rivers, streams and wetlands. A 100 m buffer zone has been designed between the delineated wetland areas and the open pit, as well as outside the 1:100 year flood lines, with the topsoil dump being utilised as a berm between the 100 m wetland buffer and the open pit. The avoidance of all water resources will ensure that potential impacts on the water resources in the Project area are mitigated. In addition, the topsoil berm will prevent any potential contaminated runoff from the open pit from reporting to the surrounding environment, although erosion from the berm may occur. The topsoil berms should be vegetated and monitored to minimise the potential for erosion to occur.

The open pit, overburden dump and infrastructure area has been demarcated as a dirty water area. Water on the surface or runoff from these areas will be collected via water conveyance structures and directed to the PCDs. The PCDs will be constructed to the north, down-gradient of the overburden dump, as well as outside of the 1:100 year flood line. A cut off drain will be located to the north of the PCDs to channel dirty water from the crushing station and infrastructure areas to the PCDs. The design and management of the PCDs will need to be undertaken in line with the requirements of the GN R704 and will be lined and sized to ensure capacity for a 1:50 year rainfall event. The sizing of the PCDs will be determined based on a water balance that will be required as part of the IWULA. The IWULA process has not yet commenced at time of this EIA and EMP report due to the required engineering designs still being investigated by WOC. The IWULA process will be initiated once the engineering designs have been completed.

Raw and potable water will be supplied from the adjacent Boikarabelo Coal Mine and the water will be pumped to Kubu Coal Mine via pipelines that will be installed along existing servitudes and access roads, as utilised for the conveyor belt. The potable water will be stored in a potable water reservoir at the infrastructure area. The capacity of the water reservoirs will be confirmed during the IWULA process. Water will be utilised for dust suppression along the access and haul roads. The water sourced from Boikarabelo Coal Mine will be from the Marapong Treatment Works. Water obtained during the dewatering process will be stored in the PCDs and used as dust suppression within the site.

5.2.7 Waste Management

General and hazardous wastes will be generated as a result of the Project. The wastes will be handled and separated at source. All recyclables will be temporarily stored in waste skips and managed through the proposed Boikarabelo Caol Mine waste management facility. The remaining general and hazardous waste will also be stored in waste skips and disposed of accordingly at a licenced waste facility. The following waste facilities are anticipated as part of the Project, as displayed in Plan 4, Appendix A:

- Two PCDs which will be sized according to GN R704 requirements;
- Overburden dumps; and
- General, domestic and hazardous waste temporary storage facilities.

A summarised waste inventory of anticipated waste streams is provided in Table 5-2[9].

Table 5-2: Summarised Waste Inventory

Waste Type	Source	Classification
Overburden and interburden	Open pit and deposited on overburden dump	Type 3 hazardous waste requiring a Class C liner.
Electronic waste	Offices and hard-park workshop	Hazardous
Scrap metals/steel	Hard-park workshop	General and hazardous
Used oil and grease	Hard-park workshop	Hazardous
Used batteries (Lead acid from mining vehicles)	Offices and hard-park workshop	Hazardous
Packaging	Offices and hard-park workshop	General
Rubber (Tyres and conveyor belts)	Hard-park workshop and conveyor belt	General
Domestic Waste	Offices and change house	General
Office Waste (paper)	Bins from office areas	General

[9] Agreements with the respective contractors have not been concluded and all agreements/confirmations of suppliers for waste, refuse and water will be provided to the DMR once concluded.

5.2.8 Power Requirements

The open pit mining equipment does not require electrical power as it will be diesel generated. The crushing station, pumps and infrastructure area will require electrical power of approximately 3 MV per annum. A power supply agreement with the municipality will be required. A power supply agreement has not yet been concluded; this will be provided to the DMR once finalised.

5.2.9 Employment Requirements

The Kubu Coal Mine is expected to require approximately 1 500 employees and personnel during the construction phase, with an approximate 390 employees permanently employed during the operational phase. The construction phase is anticipated to occur for a period of two years, with the LoM being approximately 30 years.

6 Item 3(e): Policy and Legislative Context

This section aims to provide a description of the policy and legislative context within which the Project is being proposed. This section has been divided into national, provincial and policies, plans, guidelines and development planning frameworks and tools. Table 6-1 provides a description of the national legislation that is considered applicable to the Project and its activities, with local legislation, and guidelines applicable to the Project detailed in Table 6-2 and Table 6-3 respectively.

Table 6-1: Relevant National Legislation applicable to the Kubu Coal Mine Project

Legislation and Guidelines Applicable to the Kubu Coal Mine Project	Reference Where Applied
The Constitution of the Republic of South Africa, 1996 (Act No. 108 of 1996) Under section 24 of the Constitution of the Republic of South Africa, it is clearly stated that: *Everyone has the right to (a) an environment that is not harmful to their health or well-being; and (b) to have the environment protected, for the benefit of present and future generations, through reasonable legislative and other measures that -* *(i) Prevent pollution and ecological degradation;* *(ii) Promote conservation; and* *(iii) Secure ecologically sustainable development and use of natural resources while promoting justifiable economic and social development.*	An EIA process has been undertaken to determine the impacts associated with the Project. As part of this EIA report, mitigation measures and monitoring plans have been recommended to ensure that any potential impacts are managed to acceptable levels to support the rights as enshrined in the Constitution.

Legislation and Guidelines Applicable to the Kubu Coal Mine Project	Reference Where Applied
<u>National Environmental Management Act, 1998 (Act No. 107 of 1998) (NEMA) and EIA Regulations (December 2014)</u> The NEMA, as amended, was set in place in accordance with section 24 of the Constitution of the Republic of South Africa. Certain environmental principles under NEMA have to be adhered to, to inform decision making for issues affecting the environment. Section 24 (1)(a) and (b) of NEMA state that: *The potential impact on the environment and socio-economic conditions of activities that require authorisation or permission by law and which may significantly affect the environment, must be considered, investigated and assessed prior to their implementation and reported to the organ of state charged by law with authorizing, permitting, or otherwise allowing the implementation of an activity.* The EIA Regulations, 2014, in GN R.982 were published on 04 December 2014 and came into effect on 08 December 2014. The Minister also published GN R.983 (Listing Notice No. 1), GN R.984 (Listing Notice No. 2) and GN R.985 (Listing Notice No. 3) identifying activities requiring environmental authorisation: ▪ Regulation GN R.983 - Listing Notice 1: This listing notice provides a list of various activities which require environmental authorisation and which must follow a basic assessment process; ▪ Regulation GN R.984 – Listing Notice 2: This listing notice provides a list of various activities which require environmental authorisation and which must follow an environmental impact assessment process; and ▪ Regulation GN R.985 – Listing Notice 3: This notice provides a list of various environmental activities which have been identified by provincial governmental bodies which if undertaken within the stipulated provincial boundaries will require environmental authorisation. The basic assessment process will need to be followed.	The EIA process has been undertaken in accordance with the principles of Section 2 of NEMA as well as with the EIA Regulations, 2014.
<u>National Environmental Management: Waste Act, 2008 (Act No. 59 of 2008) (NEM:WA)</u> Waste management activities in respect of which a WML is required are to be undertaken in accordance with	An application for authorisation was submitted for activities that trigger the listed activities published in GN R.921, such as

Legislation and Guidelines Applicable to the Kubu Coal Mine Project	Reference Where Applied
section 20 (b) of NEM:WA. The Minister of the Department of Environmental Affairs[10] promulgated a list of waste management activities under GN R.921 of 29 November 2013. Included in the list of waste activities are activities listed under Category A, B and C. These activities include inter alia the following: ▪ Category A describes waste management activities requiring a Basic Assessment process to be carried out in accordance with the EIA regulations supporting an application for a waste management licence; ▪ Category B describes waste management activities requiring an Environmental Impact Assessment process to be conducted in accordance with the EIA regulations supporting a waste management licence application; and ▪ Category C describes waste management activities that do not require a WML but these activities will have to comply with the prescribed requirements and standards as prescribed by the Minister, which includes the Norms and Standards for Storage of Waste, 2013. GN R632 and GN R633 were published on 24 July 2015 to include residue stockpiles and residue deposits under the framework of the NEM:WA, resulting in residue stockpiles and residue deposits being included as a waste management activity.	the overburden dump.
National Water Act, 1998 (Act No. 36 of 1998) (NWA) The NWA provides for the sustainable and equitable use, and protection of water resources. It is founded on the principle that the National Government has overall responsibility for and authority over water resource management, including the equitable allocation and beneficial use of water in the public interest, and that a person can only be entitled to use water if the use is permissible under the NWA.	An IWULA and an associated IWWMP are required in terms of Section 21 of the NWA for the Project. The IWULA and IWWMP will be compiled and submitted to the DWS as the decision making authority. The water uses which may be triggered under Section

[10] Previously the Department of Water and Environmental Affairs

Legislation and Guidelines Applicable to the Kubu Coal Mine Project	Reference Where Applied
GN R 704 was published in June 1999 and aims to regulate the use of water for mining and related activities for the protection of water resources and states the following: ▪ Regulation 4: No residue deposit, reservoir or dam may be located within the 1:100 year flood line, or less than a horizontal distance of 100 m from the nearest watercourse. Furthermore, person(s) may not dispose of any substance that may cause water pollution; ▪ Regulation 5: No person(s) may use substances for the construction of a dam or impoundment if that substance will cause water pollution; ▪ Regulation 6 is concerned with the capacity requirements of clean and dirty water systems, and ▪ Regulation 7 details the requirements necessary for the protection of water resources.	21 of the NWA in relation to the Project are listed below: ▪ S21(a) – Taking water from a water resource; ▪ S21(b) – Storing water; ▪ S21(c) – Impeding or diverting the flow of water in a watercourse; ▪ S21(f) – Discharging waste or water containing waste into a water resource through a pipe, canal, sewer, sea outfall or other conduit; ▪ S21(g) – Disposing of waste in a manner which may detrimentally impact on a water resource; ▪ S21(i) – Altering the bed, banks, course or characteristics of a watercourse; and ▪ S21(j) – Removing, discharging or disposing of water found underground if it is necessary for the efficient continuation of an activity or for the safety of people.
Mineral and Petroleum Resource Development Act, 2002 (Act No. 28 of 2002) (MPRDA)	An EIA process has been undertaken to meet the requirements of the MPRDA read

Legislation and Guidelines Applicable to the Kubu Coal Mine Project	Reference Where Applied
A MRA has been submitted to the DMR in terms of the MPRDA. The MPRDA requires that mining companies assess the socio-economic impacts of their activities from start to post-closure. Companies must develop and implement a comprehensive Social and Labour Plan (SLP) to promote socio-economic development in their host communities and to prevent or lessen negative social impacts.	with the EIA Regulations, 2014.
<u>National Environmental Management: Biodiversity Act, 2004 (Act No. 10 of 2004) (NEM:BA)</u> The NEM:BA regulates the management and conservation of the biodiversity of South Africa within the framework provided under NEMA. This Act also regulates the protection of species and ecosystems that require national protection and also takes into account the management of alien and invasive species. The following regulations which have been promulgated in terms of the NEM:BA are also of relevance: ▪ Alien and Invasive Species Lists, 2014 published (GN R.599 in GG 37886 of 1 August 2014); ▪ National Environmental Management: Biodiversity Act, 2004: Threatened and Protected Species Regulations; and ▪ National list of Ecosystems Threatened and in need of Protection under Section 52(1) (a) of the Biodiversity Act (GG 34809, GN R.1002, 9 December 2011).	As part of this Project, a flora, fauna, wetlands and aquatic assessment has been undertaken to determine the current status of the environment and to determine any potential ecological sensitivities to be avoided and/or mitigated. There are currently no applications submitted in terms of NEM:BA for the Project. Red Data species occur on site which will require permits for their relocation of destruction. The required permits will be applied for prior to any activities taking place. All alien plant species on site were categorised according to the Alien and Invasive Species List, 2014, as Category 1b species, which requires control through the development and implementation of an alien invasive management programme.

Legislation and Guidelines Applicable to the Kubu Coal Mine Project	Reference Where Applied
National Environmental Management: Air Quality Act, 2004 (Act No. 39 of 2004) (NEM:AQA) According to the NEM: AQA, the DEA, the provincial environmental departments and the local authorities (district and local municipalities) are separately and jointly responsible for the implementation and enforcement of various aspects of NEM: AQA. A fundamental aspect of the new approach to the air quality regulation, as reflected in the NEM: AQA, is the establishment of National Ambient Air Quality Standards (NAAQS). These standards provide the goals for air quality management plans and also provide the benchmark by which the effectiveness of these management plans is measured.	An Air Quality Assessment, as part of the EIA process, has been undertaken to determine the baseline conditions of the air prior to the implementation of the proposed mining activities. The required measures have been included in the EMP.
National Forests Act, 1998 (Act No. 84 of 1998) Species that are nationally protected have been listed under the Protected Trees List as part of the National Forests Act, 1998 (Act No. 84 of 1998).	A fauna and flora assessment has been undertaken and forms part of the EIA report, as well as being included as Appendix F. An application for a license will be submitted to the Minister responsible in terms of the National Forests Act for Species of Special Concern (SSC), prior to site clearing activities taking place.
National Heritage Resources Act, 1999 (Act No. 25 of 1999) (NHRA) The NHRA is the overarching legislation that protects and regulates the management of heritage resources in South Africa. The Act requires that Heritage Resources Agencies, in this case the South African Heritage Resources Agency (SAHRA) and Limpopo Provincial Heritage Resources Authority (LIHRA), be notified as early as possible of any developments that may exceed certain minimum thresholds. The NHRA furthermore affords general and formal protection of certain categories of heritage resources including: ▪ National and provincial heritage sites under Section 27; ▪ Certain types of protected areas under Section 28;	A Notice of Intent to Develop (NID) will be submitted to the SAHRA and the Limpopo Heritage Resources Authority (LIHRA).

Legislation and Guidelines Applicable to the Kubu Coal Mine Project	Reference Where Applied
▪ Heritage areas under Section 32; ▪ Certain structures under Section 34; ▪ Archaeological and palaeontological resources and meteorites under Section 35; ▪ Certain categories of burial grounds and graves under Section 36; and ▪ All public monuments and memorial under Section 37.	
The Mine Health and Safety Act, 1996 (Act No. 29 of 1996) This Act is administered by the Mine Health and Safety Inspectorate of the DMR. The Mine Health and Safety Act, 1996 (Act No. 29 of 1996) is set out to provide for protection of the health and safety of employees and other persons at mines and to require employers and employees to identify hazards and eliminate, control and minimise the risks relating to health and safety at mines. Section 2(1) of the act requires; *"2. (1). The owner of every mine that is being worked must* *a) ensure, as far as reasonably practicable, that the mine is designed, constructed and equipped* *(i) to provide conditions for safe operation and a healthy working environment; and* *(ii) with a communication system and with electrical, mechanical and other equipment as necessary to achieve those conditions"*	Health and safety policies and procedures will be developed for the construction, operation and decommissioning of the proposed mine.
Explosives Act, 1956 (Act No. 26 of 1956) This Act makes provision for, among other matters, storage, transport and the use of explosives. Section 6 of the Act makes provision for storage of explosives in licensed premises and Section 9 makes provision for use of blasting material without a permit.	The applicant will ensure that the external contractors are in possession of the relevant license regarding storage and handling of explosives on site.
Environmental Conservation Act, 1989 (ECA), (Act No. 73 of 1989) - National Noise Control	A Noise Impact Assessment has been undertaken as part of the EIA process to

Legislation and Guidelines Applicable to the Kubu Coal Mine Project	Reference Where Applied
Regulations, GN R.154 (10 January 1992) These regulations make provision for guidelines pertaining to noise control and measurements. The regulations make reference to the use of the South African National Standards 10103:2008 (SANS) guidelines for the Measurement and Rating of Environmental Noise with Respect to Land Use, Health, and Annoyance and to Speech Communication.	understand the impact of the proposed mine activities on the ambient noise environment.

Table 6-2: Provincial Legislation Applicable to the Kubu Coal Mine Project

Legislation and Guidelines Applicable to the Kubu Coal Mine Project	Reference Where Applied
Limpopo Environmental Management Act, 2003 (Act No. 7 of 2003) (LEMA) The Limpopo Environmental Management Act, 2003 (Act No. 7 of 2003) (LEMA), is aimed at managing and protecting the environment in the Limpopo Province as well as securing ecologically sustainable development and responsible use of natural resources in the Province.	Protected species have been listed in the Protected Species; Schedule 12 of the LEMA requires permitting prior to relocation.
Limpopo Heritage Regulations GN R103 The LIHRA has been established and is responsible for the management of heritage resources in the Province.	An Archaeological Impact Assessment (AIA) was compiled and submitted to the SAHRA in 2009 for the farm Koert Louw Zyn Pan, with SAHRA having already provided comments. An NID will be submitted to the SAHRA and LIHRA to detail the findings of the 2009 AIA and will be based on existing information regarding the cultural heritage resources.

Table 6-3: Policies, Plans and Guidelines Applicable to the Kubu Coal Mine Project

Legislation and Guidelines Applicable to the Kubu Coal Mine Project	Reference Where Applied
DWS[11] Best Practice Guideline – G1: Storm Water Management Plan (SWMP) These are guidelines provided by the DWS for the development of a SWMP. The following will be undertaken to develop the conceptual SWMP: ▪ Delineate the clean and dirty area contributing to runoff (based on the final layout plans) and site specific hydrological assessments to determine volumes that require to be handled. The SWMP should ensure that temporary drainage installations should be designed, constructed, and maintained for recurrence periods of at least a 25-year, 24-hour event, while permanent drainage installations should be designed for a 50-year, 24-hour recurrence period; and ▪ Site specific assessments to establish the appropriate mitigation measures and surface water monitoring programme.	All water management infrastructure will be designed for a 50 year, 24 hour rainfall event.
DWS Best Practice Guidelines - G3. Water Monitoring Systems Water monitoring is a legal requirement, with the most common environment management actions requiring sufficient data which can be supplied through monitoring programmes. The Best Practice Guidelines G3 are provided by the DWS to ensure that monitoring programmes set out to determine a comprehensive baseline, identify source and extent of pollution, monitor water usage and assess compliance with set standards and legislation, among others.	The water monitoring programmes provided in this EIA and EMP report have taken the Best Practice Guidelines into consideration.

[11] Previously the Department of Water Affairs and Forestry (DWAF)

Legislation and Guidelines Applicable to the Kubu Coal Mine Project	Reference Where Applied
DWS Best Practice Guideline – G4: Impact Prediction The impacts of mine activities on the groundwater environment must be assessed as part of the MRA, as well as for the IWULA. The baseline conditions must be assessed to define the current aquifer systems, groundwater use and groundwater conditions before mine commencement and to determine the extent of possible future impacts on the groundwater resources.	An IWULA and an associated IWWMP are required in terms of Section 21 of the NWA. The IWULA and IWWMP will be compiled and submitted to the DWS as the decision making authority. The EIA as part of the MRA will assess potential impacts on groundwater resources as a result of the Project.
DWS Best Practice Guideline A4. Pollution Control Dams PCDs form an integral and important part of the water management systems on a mine. The purpose of PCDs are to minimise the impact of polluted water on water resources, to minimise the area that is polluted as far as possible and to capture and retain all dirty water within an operation. These guidelines provide the general principles for water management on PCDs, to provide guidelines on planning and operation of PCDs and to ensure the potential impacts on safety and the water resources are managed over the LoM.	The PCDs will be designed and operated according to the DWS Best Practice Guideline A4.
DWS Best Practice Guidelines A5. Water Management for Surface Mines These guidelines deal specifically with the water management aspects related to surface mining activities and the applicability and interaction between the various Best Practice Guidelines. The guidelines detail the general principles for water management and involve pollution prevention, minimisation of impacts and discharge and/or disposal of waste water or dirty water.	The Kubu Coal Mine will be operated according to the DWS Best Practice Guidelines.
Integrated Development Plan (IDP)	The IDP has been taken into consideration during the development of

Legislation and Guidelines Applicable to the Kubu Coal Mine Project	Reference Where Applied
An IDP is a municipal-level planning document that aims to provide a developmental framework for regional and local government, in which municipalities must provide leadership, management, budgeting, and direction in the provision of services and infrastructure. The IDP serves to guide developmental planning and community development. Municipal IDPs highlight local needs and priorities that could be considered by the Project.	the Project.
<u>Spatial Development Framework (SDF)</u> A SDF an integral part of the IDP and is a spatial planning policy that aims to inform the determination of development proposals and applications. The SDF serves to stimulate debate and consider emerging development, investment and economic trends within the District Municipality.	The SDF of the Waterberg Municipality has been reviewed and taken into consideration for this Project. The Kubu Coal Mine falls within the Potential Development Area 1, as a mining zone, identified by the SDF

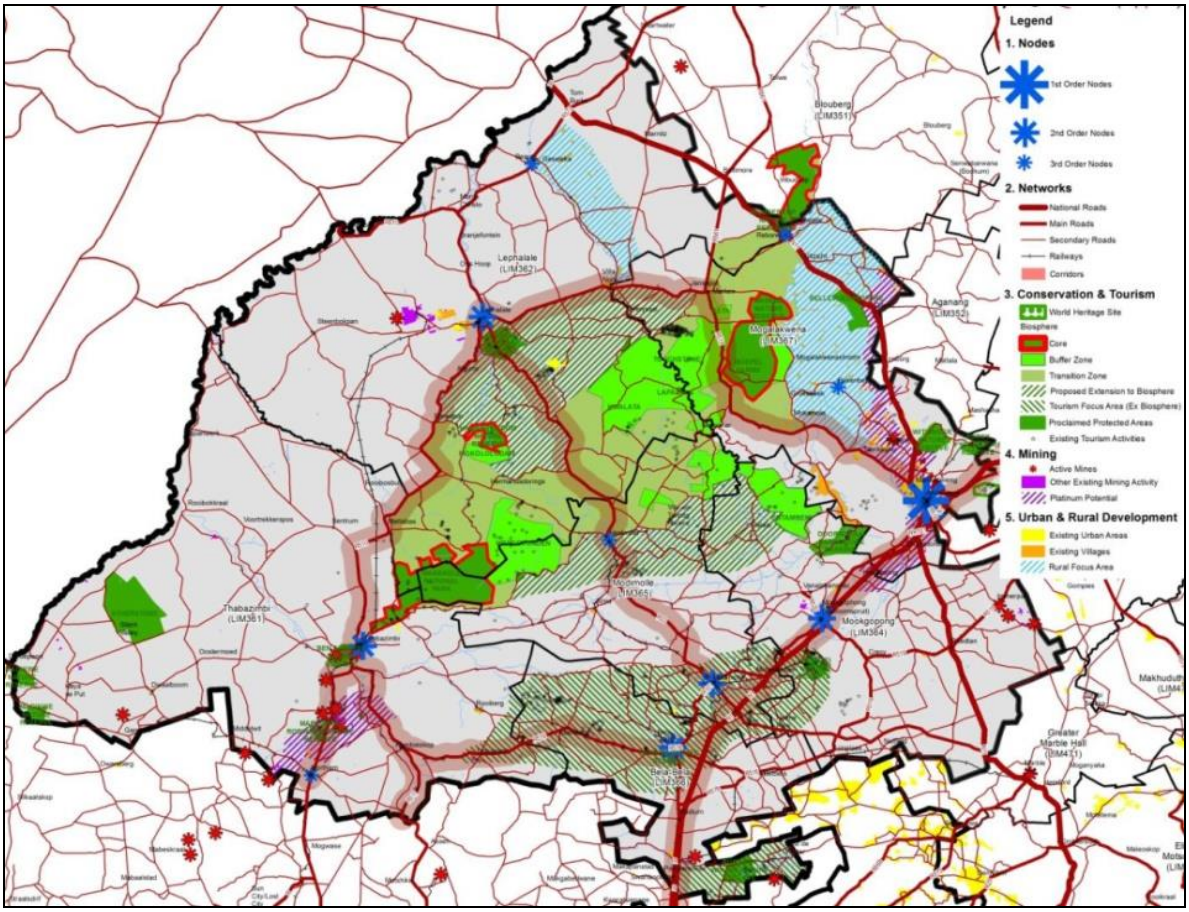
7 Item 3(f): Need and Desirability of the Proposed Activities

Coal plays a vital role in South Africa's energy-economy, accounting for approximately 70% of primary energy consumption, 93% of electricity generation and 30% of petroleum liquid fuels (Eberhard, 2011). Although the South African Government is seeking new and alternative energy sources (White Paper on the Renewable Energy Policy for South Africa, 2003), the use of coal for power generation locally is unlikely to change significantly in the next 20 years due to the inability of alternative energy sources to meet the current demand. In addition, the power crisis within South Africa is of national importance, resulting in increased demand for coal for power generation. Thus, the demand for coal for local power generation is likely to remain stable for the short to medium term, ensuring that there will be continued demand for the coal produced at Kubu Coal Mine. The contribution of mining to the Lephalale Municipality GDP is 59% and is recognised as the pillar of the local economic base and key job provider within the regions (Waterberg SDF, 2009).

In addition, South Africa has the world's second largest coal export terminal at Richards Bay, which is located between the Atlantic and Pacific coal markets. South Africa is the fifth largest coal exporter in the world and the sixth largest coal producer (Eberhard, 2011). Evidently, there is still significant global and local demand for coal products and the development of the Kubu Coal Mine will be able to provide to such markets, with an expected 3.3 million tonnes of coal to be provided per annum to each of the international and local markets. Such production will result in considerable contributions to the local and national GDP through tax and royalties from the operation.

The Lephalale IDP has identified potential development areas within the municipality that align with the Spatial Development Framework. The Potential Development Area 1 includes the node surrounding Steenbokpan, which is located 17 km south-southeast of the Kubu Coal Mine, as an area zoned for mining. Steenbokpan is the epicentre of Potential Development Area 1 and involves the entire coal resource up to the border of Botswana (IDP, 2014/2016), also demarcated as the mining zone or focus area 3 (IDP, 2014/2016). The development node around Steenbokpan has been demarcated based on current mining activities, as well as future potential mining activities. The Lephalale IDP identifies this area of national importance in terms of addressing the energy issues of the country, as well as job creation within the municipality. The development of the Kubu Coal Mine falls within the Potential Development Area 1 of Steenbokpan node and aligns with the strategic development framework set out by the municipality. Although the current land use in the region is predominantly game farming and hunting, the development of the node will change to that of mining. The Boikarabelo Coal Mine is being established adjacent to the Kubu Coal Mine, which will reduce the potential impact on the sense of place as a result of the Project. Furthermore, the Kubu Coal Mine has been developed taking into account identified sensitivities on site and has avoided the 1:100 year floodline, implemented a 100 m buffer from all wetlands and avoided areas of high ecological sensitivity. The Waterberg SDF is provided in Figure 7-1.

The Lephalale IDP cites unemployment as a serious concern that requires urgent attention. Unemployment rates are estimated at 27% amongst residents aged between 15 years and 34 years (Lephalale IDP, 2013 – 2016). The development of the Kubu Coal Mine will result in the employment of approximately 1 500 temporary employees during the construction phase and further 390 permanent employees during the operational phase. The construction phase is anticipated to last for 1 year, with the LoM being 30 years which will contribute to job stability and upliftment of the local communities.



(Source: Urban-Econ, 2015)

Figure 7-1: Waterberg SDF

8 Item 3(g): Motivation for the Preferred Development Footprint within the approved Site including a full Description of the Process followed to reach the Proposed Development Footprint within the approved site

The infrastructure layout for the proposed Kubu Coal Mine is provided in Plan 4, Appendix A. The infrastructure layout was determined taking into account environmental sensitivities, with particular attention regarding the wetland areas, floodplains of the Limpopo River and ecological sensitivities associated with these areas. The highest quality coal occurs in the upper coal zones closest to the surface, with the measured resource located on the eastern and south-eastern portions of the Project area, and the remainder of the farm being classified as an indicated resource. As a result, the open pit has been focussed around the eastern and south-eastern area.

The wetland delineation was undertaken for the Project area, with the 1:100 year flood line for the Limpopo River and all water courses on site delineated. The open pit has been developed to take cognisance of the wetland areas and 1:100 year flood lines of the water courses on site. A 100 m buffer has been implemented between the wetland areas, as well as outside the 1:100 year flood lines, to ensure that any potential impacts on water resources are avoided. The highest ecological sensitivity on the Project area coincides with the wetland areas and watercourses in the north of the Project site and, thus, the high ecological sensitivities have been avoided through the implementation of the 100 m buffer. The exclusion of the wetland areas and floodplain of the Limpopo River has removed 378 ha of mineable coal resources from the proposed Project.

The elevation of the Project area decreases towards the north and northwest as the site drains towards the Limpopo River. As a result, the overburden dump, crushing station and ROM tip area and infrastructure have been located up gradient of the open pit, along the southern border. This ensures that any potential contaminated or dirty water runoff of the overburden dump or infrastructure does not report to the catchment. A cut off drain has been located to the north of the overburden dump and infrastructure area to channel all potential runoff into the PCDs. The likelihood of contaminated water reporting to the catchment from the overburden dump and infrastructure area is negligible due to the cut off drains in place, the open pit down gradient of the sites and the distance to the wetland areas and flood plains.

The topsoil stripped during site clearing activities will be stockpiled in a berm that will be located along the northern border of the open pit. The topsoil berm will aim to prevent water from the open pit from reporting to the catchment, as well as preventing clean water flowing into the open pit and becoming contaminated. All water falling within the open pit, ROM tip area, infrastructure and overburden dump will be characterised as dirty water and will be channelled via a cut off drain to the PCDs.

The ROM coal will be transported to the adjacent Boikarabelo Coal Mine, once crushed, for further beneficiation before being sold as a primary or secondary product to the international and local markets respectively. The ROM coal will be transported via an overland conveyor to the adjacent Boikarabelo Coal Mine, which will make use of existing servitudes and access roads throughout the area. By utilising existing servitudes and access roads, the extent of vegetation that will be cleared for the conveyor construction and operation is significantly reduced. Potential impacts to sensitive areas have been avoided as far as possible in the development of the mine layout plan, as illustrated in Plan 4, Appendix A, indicating the wetland areas and flood plains of the Limpopo River in relation to the infrastructure and open pit.

8.1 Item 3(g)(i): Details of the Development Footprint Alternatives Considered

Alternatives are different means of meeting the general purpose and need of a proposed activity. Alternatives help identify the most appropriate method of developing a project, taking into account location or site alternatives, activity alternatives, process or technology alternatives, temporal alternatives or the no-go alternative. Alternatives also help identify the activity with a reduced environmental and/or social impact.

With reference to mining, the nature of the ore deposit determines the mining activities and processes. The location of the resource precludes any alternative for the mining operation. The following section provides an overview of the alternatives identified, including:

- Mining method alternatives;
- Infrastructure alternatives; and
- No-go option.

The preferred alternatives that have been taken into the impact assessment is outlined in Plan 4, Appendix A and includes the implementation of a 100 m buffer from all wetland areas, and the truck and shovel mining of the coal reserves within the Kubu Coal Mine Project area. The coal will be crushed on site and transported to Boikarabelo Coal Mine via overland conveyor where it will be beneficiated and sold.

8.1.1 Mining Method

The mining method to be implemented at the proposed Kubu Coal Mine will be open pit, truck and shovel mining. The location of the coal zones on site range from 20 mbgl to 160 mbgl. Underground mining is generally only feasible for coal seams or zones that are greater than 40 m in depth and that have a competent roof support structure. Coal zones 9 to 11 are characterised by bright or vitrinite coals and provide the highest yield and coal quality and thus, due to coal zone 11 being approximately 20 mbgl, open pit mining is the preferred mining method to be implemented. The coal zones will be mined in descending order as the open pit is expanded. The open pit will begin mining coal zone 11 (approximately 20 mbgl) and will expand in depth to the subsequent coal zones.

Truck and shovel mining is the most feasible mining method as it makes use of diesel powered shovels and haul trucks. The use of a dragline is not feasible to mine the coal reserves due to the limited length of the cuts that will be mined, particularly in the northern extent of the open pit where the 100 m buffer zone restricts the open pit size. The cuts of the open pit are not suitable for the long strip mining required by draglines.

Underground Coal Gasification was also considered but cannot be developed as there are no solid roof structures nor does the coal gasify as readily as other South African coal deposits.

8.1.2 Infrastructure and Layout Alternatives

Infrastructure alternatives considered include the transport of ROM coal to the Boikarabelo Coal Mine. Infrastructure on site has been limited, with the intention to use Boikarabelo Coal Mine's infrastructure as far as possible.

No beneficiation of ROM coal, other than crushing, will take place on Kubu Coal Mine and the crushed ROM coal will be transported to Boikarabelo Coal Mine. The use of a conveyor belt versus truck hauling was investigated to determine how the ROM coal will be transported to Boikarabelo Coal Mine. The overland conveyor route will make use of existing servitudes and access routes to limit the potential impacts associated with construction activities and site clearing. The use of the conveyor will have fewer impacts in the long term as truck hauling will result in the generation of dust emissions on the haul roads throughout the LoM. The use of the conveyor belt is likely to be more economically viable as an electricity source will be used to transport the coal as opposed to a diesel powered fleet. The use of truck hauling on gravel roads between Kubu Coal Mine and Boikarabelo Coal Mine is likely to be a source of significant air quality impacts through dust generation, as well as due to the release of NO_x and SO_2 from the trucks; the conveyor belt will consist of a roof to reduce such impacts. The use of heavy vehicles will also be a health and safety risk for residents that utilise the surrounding road network and the elimination of the use of truck hauling will significantly decrease the risk of health and safety incidents. In comparison, once the conveyor belt has been constructed, access to the servitude will be restricted, preventing long term impacts. In addition, the running costs associated with the conveyor belt are much lower in comparison to the hauling of coal via trucks.

The site layout has taken the specialist investigations into consideration, as well as I&APs' issues and concerns. The site layout has been selected based on the following motivation:

- The overburden dump is located up-gradient of the open pit and falls within the dirty water management area;
- The infrastructure and ROM tip area and crusher are located adjacent to the overburden dump, up-gradient of the open pit and within the dirty water management area;
- The open pit has been designed to take into consideration the highest value coal resource and has excluded high ecological sensitivities and wetland areas with a 100 m buffer implemented, as well as having been placed outside of the 1:100 year floodlines of the Limpopo River. The removal of the wetland areas and floodplain of the Limpopo River from the mine plan has resulted in 378 ha of coal resources being excluded from the mine plan;
- The conveyor route will follow existing servitudes to prevent unnecessary or excessive clearing and disturbance of vegetation; and
- The topsoil dumps will be located to the north of the open pit to act as a berm to prevent potential contaminants from reporting to the surrounding environment.

8.1.3 The Option of Not Implementing the Activity

The no-go option would entail the Project area remaining in its current form and no mining activities would be undertaken by WOC; the land use alternatives are restricted based on the land capability of the site. The land capability for the Project area is detailed in Section 9.3.2 and indicates that the Project area is not suitable for arable agriculture and, thus, the cultivation of crops is not a feasible alternative. It is likely that Koert Louw Zyn Pan will continue to operate as a game and hunting farm and no development or infrastructure construction will take place. The Project area is impacted upon due to overgrazing activities, which may impact on the long term viability of the Project area to be used as game farming.

The overgrazing activities may result in numerous impacts on the area, such as soil erosion, dust generation, surface water sedimentation and reduced biodiversity. Due to the biodiversity of the region, ecotourism is a viable land use alternative, however ecotourism would result in the construction of lodges in the area and the forming of reserves to allow for the free movement of animals. This would require numerous adjacent farms in the area removing their fencing and incorporating one large reserve to promote ecotourism. Although this land use alternative is feasible, it would require the cooperation of numerous farm owners and is not currently planned for the region surrounding Kubu Coal Mine. This land use will also be limited in extent due to the approved Boikarabelo Coal Mine adjacent to the proposed Project, as well as not conforming to the Potential Development Area 1 of the Waterberg SDF which has identified the Steenbok node as a coal mining area.

The establishment of the Kubu Coal Mine will provide approximately 1 500 temporary employment opportunities during the construction phase, and further 390 permanent employment opportunities during the LoM, resulting in significant economic contribution to the local work force and communities. The Kubu Coal Mine development will also result in significant skills training for the local communities, as well as contribute to the GDP through tax and royalties. Should the Project not proceed, the positive impacts associated with the Project will not be realised and the farm will continue to operate for the selling and hunting of game.

8.2 Item 3(g)(ii): Details of the Public Participation Process followed

A PPP has been initiated, which is central to the investigation of environmental and social impacts, as it is important that stakeholders who are affected by the Project are given an opportunity to identify concerns and to ensure that local knowledge, needs and values are understood and taken into consideration as part of the impact assessment process. The comments from stakeholders from the Scoping Phase were included in the Comment and Response Report (CRR) and used to refine the scope of specialist studies that were commissioned as part of the EIA. Furthermore, The EIA and EMP report was made available to I&APs for review to determine whether their comments had been adequately addressed, as well as to raise further comments and concerns. All comments received were included in the CRR and responses provided by the EAP and/or the applicant. Set out in this section is an overview the various activities for Public Participation (PP), but further detail can be found in the PP Report (Appendix C).

8.2.1 Stakeholder Identification

To ensure a proper representation of stakeholders interested in or affected by the proposed Kubu Coal Mine, the following identification methods were used to develop the stakeholder database (Appendix C):

- Conducting Windeed database and related desktop searches to verify landownership in and around the Project area to obtain contact details;
- Responses to be received from the newspaper advertisement and site notices;
- Responses on the distribution of the Background Information Document (BID); and
- Telephonic and one-on-one consultations with landowners and land occupiers to identify additional I&APs.

Stakeholders for the proposed Project are grouped into the following categories:

- Government: National, Provincial, District and Local authorities;
- Landowners: Directly affected, adjacent and other landowners;
- Communities: Surrounding communities;
- Non-Governmental Organisations (NGOs): Environmental and social organisations; and
- Agriculture: Associations or organisations focussed on agricultural activities.

A stakeholder database has been compiled which was updated throughout the environmental regulatory process with new stakeholders and relvant contact information updated accordingly (Appendix C). The directly affected and adjacent landowners for the proposed Project are included in Table 8-1 and Table 8-2 respectively, with the government entities provided in Table 8-3.

A stakeholder database has been compiled which was updated throughout the

Table 8-1: Landowners and Properties Directly Affected

Farm	Owner
Koert Louw Zyn Pan 234 LQ	Cathrich No 102 CC[12]

[12] Resgen South Africa (Pty) Ltd is in the process of purchasing the land. The current land was identified as Ms Jana Visnakova.

Table 8-2: Adjacent Property Details

Farm	Portion	Owner
Draai Om 244 LQ	R/E	Resgen South Africa (Pty) Ltd
Nazarov 685 LQ	R/E	Ekosto 1058 (Pty) Ltd
Witkopje 238 LQ	R/E	Resgen South Africa (Pty) Ltd
Doornkopje 235 LQ	R/E	Daniel Hermanus Steenkamp
Doornkopje 235 LQ	Portion 1	Daniel Hermanus Steenkamp

Table 8-3: Government Entities

Name	Government entities
Mr Rueben Mashego	Waterberg District Municipality
Ms E M Tukakgomo	Lephalale Local Municipality
Mr Ben Sengani	Limpopo Department of Water and Sanitation (DWS)
Mr Donald Lithole	Limpopo Heritage Resources Authority (LIHRA), Limpopo
Ms Portia Khumalo	Limpopo Department of Agriculture, Forestry and Fisheries (DAFF)
Ms Tinyiko Manganyi	Limpopo Department of Rural Development and Land Reform (DRDLR)
Ms Mapula Sathekge	Limpopo Department of Mineral Resources (DMR)
Jonathan Gafane	Limpopo Department of Roads & Transport (DRT)
Felicia Nemathaga	National Department of Water and Sanitation (DWS)
Lucas Mahlangu	National Department of Environmental Affairs (DEA)

8.2.2 Consultation with Interested and Affected Parties

Considering the legislative requirements and good practice, the following methods have been implemented to disseminate information to stakeholders about the proposed Project, as summarised in Table 8-4.

- Project Announcement Letter: a letter formally announcing the Project was distributed to stakeholders on 25 September 2015. This letter provides a broad overview of the proposed Project, applicable legislation and the independent EAP. A Registration and Comment Form was also provided to stakeholders to use for formal registration as I&APs, to submit comments or ask questions;
- BID: includes the location and a description of the proposed Project, the legislative processes and requirements that will be followed, the specialist studies to be

conducted, the relevant competent authorities and the consultation and registration process including contact details of the responsible person representing the EAP;

- Newspaper Advertisement: an English newspaper advertisement was placed in the Mogol Post, local newspaper on 25 September 2015. The advert included a brief Project description, information about the applicable legislation, the competent authorities and details of the appointed EAP; and
- Site Notices: English site notices were put up at various places as indicated in Table 8-4. The site notices contained a brief Project description, information about the required legislation, the competent authorities and details of the appointed EAP.

During the Scoping Phase a public meeting was held with stakeholders on 22 October 2015 to share the contents of the Scoping Report and Plan of Study for the EIA Phase. The following sectors of society were represented at the public meeting:

- National Government (Department of Water and Sanitation);
- Provincial Government (Limpopo Department of Water and Sanitation);
- Local Government (Lephalale Local Municipality);
- Local community Ward Councillor, members and community forums;
- Farmers and Steenbokpan Boere Unie; and
- Local Business (Exxaro).

Telephonic discussions were also conducted with key stakeholders to remind them of the process and public meeting. As part of these discussions and the formal public meeting, comments and concerns from stakeholders were obtained and through discussions local knowledge was gathered to inform specialist studies. At the public meeting a PowerPoint presentation was shown and included the following details:

- Project motivation;
- Overview and description of the Project;
- Maps for regional setting, local setting and infrastructure layout;
- Applicable legislative requirements;
- Various project activities with associated potential impacts;
- List of specialist studies to be undertaken;
- Timing of the environmental regulatory process; and
- Contacts details for Digby Wells.

On request from the LLM, a meeting was held on Friday, 30 October 2015 at the Council Chambers, Lephalale Local Municipality offices. The PowerPoint presentation could not be completed and the meeting was adjourned by the Lephalale Mayor, Mr Moloko Jack Maeko. The Council requested that WOC engage with the Council henceforth.

A one-on-one stakeholder meeting was also undertaken with adjacent landowner, Mr Danie Steenkamp on Friday, 30 October 2015 in Lephalale. Efforts to secure a meeting with directly affected landowner Ms Jana Visnakova was unsuccessful, although WOC has been in contact with her regarding the proposed Project and she was represented at the public meeting though another landowner. Ms Visnakova was also invited to provide comments.

Following the compilation of the EIA and EMP report, a notification announcement letter was sent to all stakeholders and I&APs on 3 February 2016 announcing the availability of the EIA and EMP report for public comment, as well as the date for the public meeting. The EIA and EMP report was available for comment to the public for a period of 30 days from 5 February to 7 March 2016. A public meeting was held on 23 February 2016 at Lesedi Thukudu Thusong Centre, Steenbokpan to share the findings of the specialist studies and content of the EIA and EMP report and to obtain further comments from stakeholders.

With submission of the updated EIA and EMP reports to the competent authority, stakeholders have the opportunity to view these reports on the Digby Wells website. In this regard, a notification letter was distributed to the full database via email and post.

All comments raised by stakeholders from the Scoping and EIA Phases were captured in the CRR. Stakeholder comments were closely considered and addressed, where applicable, by the Project team.

Table 8-4: Summary of Public Participation Process

Activity	Details	Reference in Report
Identification of stakeholders	Stakeholder database which includes I&APs from various sectors of society, including directly affected and adjacent landowners, in and around the proposed Project area.	**Appendix C** Stakeholder database
Land Claims Enquiry	The Provincial Land Claims Commissioner was informed on ***11 August 2015***, by means of a formal letter, requesting confirmation if any land claims exist on the affected properties. A response was received on 14 October 2015 stating that there is no information pertaining to land claims for the directly affected and adjacent properties.	**Appendix C** Land claims letter
Distribution of announcement letter and Background Information Document (BID)	BID and formal Project announcement letter with registration and comment sheet was emailed and posted to stakeholders on ***Thursday, 29 September 2015***.	**Appendix C** BID, and project announcement letter
Placement of newspaper advertisement	An English advertisement was in the Mogol Pos on ***Friday, 25 September 2015***.	**Appendix C** Advertisement
Placement of site notices	English site notices were put up at the proposed Project site and public places on ***Thursday, 01 October 2015***.	**Appendix C** Site notices

Activity	Details	Reference in Report
	These include: ▪ Lephalale Public Library; ▪ At a local General Dealer Shop; ▪ At a local tuck shop; ▪ At a Community Hall in Steenbokpan; and ▪ On the D175 road towards Kubu Mine Site. Various points around the proposed Project area. A site notice placement map and report has been developed, indicating the various points where site notices were placed.	
Announcement of Scoping Report	Announcement of availability of the Scoping Report was done is conjunction with formal announcement of the Project. Notification that was emailed and posted to stakeholders on 28 September 2015. Copies of the Scoping Report for public comment were made available at: ▪ Lephalale Local Municipality Public Library; and ▪ Lesedi Village, Steenbokpan; The Scoping Report was made available on www.digbywells.com (under Public Documents) and at the Public Meeting. *(Comment period: **01 October to 06 November 2015**)*	**Appendix C** Announcement Letter
Stakeholder meetings	The following stakeholder meetings were undertaken: ▪ A Public Meeting for all stakeholders was held on ***Thursday, 22 October 2015 at 10:00 – 12:00*** at Letsedi Lodge, Steenbokpan; ▪ Focus Group Meeting with the Lephalale Local Municipality on ***Friday, 30 October 2015 at 10:00 – 11:00***, Lephalale Local Municipality offices; and ▪ One-on-one meeting with adjacent landowner, Mr Danie Steenkamp (landowner of the farm Doornkopje 235 LQ) on ***Friday, 30 October 2015*** in Lephalale.	**Appendix C** Comment and Response Report Attendance Register
Announcement of Updated Scoping Report	Announcement of the availability of the updated Scoping Report was emailed and posted to stakeholders together with a Registration and Comment Form on **13 November 2015**. The FSR was available on www.digbywells.com (Public Documents). *(Comment period: **16 November – 7 December 2015**)*	**Appendix C** Public Participation Materials

Activity	Details	Reference in Report
Obtained comments from stakeholders	Comments, issues of concern and suggestions received from stakeholders have been captured in the CRR.	**Appendix C** Comment and Response Report
Announcement of Draft EIA and EMP Report	Announcement of availability of the Draft EIA Report was emailed and posted to stakeholders on 3 February 2016. Copies of the EIA and EMP Report for public comment were made available at: ▪ Lesedi Village, Steenbokpan; and ▪ Lephalale Local Municipality Public Library. The Draft EIA and EMP Report was made available on www.digbywells.com (under Public Documents) and at the Public Meeting. *(Comment period: **05 February to 07 March 2016**)*	**Appendix C** Announcement Letter
Stakeholder meeting	The following stakeholder meeting was undertaken: ▪ A Public Meeting for all stakeholders was held on ***Tuesday 23 February 2016 at 10:00 – 12:00*** at Lesedi Tshukudu Thusong Centre, Steenbokpan.	**Appendix C** Comment and Response Report Attendance register
Announcement of updated EIA and EMP Report	Announcement of the availability of the updated EIA and EMP Report was emailed and posted to stakeholders on **24 March 2016**. The updated EIA and EMP Report was available on www.digbywells.com (Public Documents). *(Comment period: **30 March 2016 – 19 April 2016**)*	**Appendix C** Announcement Letter

8.3 Item 3(g)(iii): Summary of Issues Raised by I&APs

Table 8-5, Table 8-6 and Table 8-7 provides a summary of comments received from stakeholders during the Scoping Phase, and a full record of comments is included in the CRR (Appendix C).

Table 8-5: Interested and Affected Parties

Interested and Affected Parties		Date of comments received	Issues raised	EAPs response to issues as mandated by the applicant	Consultation Status (consensus dispute, not finalised, etc.)
Name of Individual	**Consulted**				
Landowners					
Becker Pelser Landowner	Public Meeting	22-Oct-15	What is the timeframe for the mining; when will it start? Temo and Sasol will start in 2017 and WOC will start in 2019 - this timing is too close to each other, where will the water be sourced from?	The water to be used by Kubu Coal Mine will be supplied by Boikarabelo Coal Mine, once the WULA has been approved by the DWS.	Resolved
Wim Moritz Biemond Landowner	Written Comment	7-Feb-16	Job seekers will cross illegally over my property the border to the project from Botswana. Burglary, attacks, illegal poaching and snaring will increase as the project unfolds and people don't get employed by the project.	Population influx has been identified as a potential impact as a rsult of the Project. Mitigation and management measures have been provided to mitigate such impacts. Your concerns have been noted.	Noted
Wim Moritz Biemond Landowner	Public Meeting	23-Feb-16	Digby Wells did a study on a wellfield at for the Mmamabula project - the cumulative model shows that the groundwater level does not reach Limpopo. I don't believe you will draw from Botswana's water. There will be big issues with regards to water. I will come to Waterberg One Coal when my groundwater resources are depleted. There are few farmers that will be affected and WOC need to monitor groundwater closely, especially during droughts.	A groundwater monitoring programme will be implemented to monitor potential impacts to groundwater levels. Furthermore, a condition of authorisation has been included to undertake a numerical model specific to Kubu Coal Mine prior to any activities taking place.	Resolved
Lawful occupier/s of the land					
No comments received to date.					
Landowners or lawful occupiers on adjacent properties					
Danie Steenkamp Landowner	One-on-one Meeting	30-Oct-15	Government developed boreholes close to project area for government workers to use and accommodation close to my house.	Thank you for the comment, it is noted.	Noted
Danie Steenkamp Landowner	One-on-one Meeting	30-Oct-15	The unpleasant smells will cause negative impact on my hunting operations and camp that is located adjacent to the border of the mining right area.	Your concern has been noted. An Air Quality Impact Assessment has been undertaken along with dispersion modelling. Although odours are not modelled, dust fallout, PM_{10} and $PM_{2.5}$ emissions have been modelled and indicate that the NAAQS and NDCR limits will not be exceeded at the nearest sensitive receptors with the implementation of the mitigation measures.	Noted
Danie Steenkamp Landowner	One-on-one Meeting	30-Oct-15	How will the influx of people to the area affect my security and poaching issues experienced in the area?	The social impact assessment has been undertaken and has identified population influx and the resultant social ills as potential impacts. The Social Impact Assessment has provided mitigation measures, which are included in the EMP, to mitigate potential impacts associated with population influx.	Consensus

Interested and Affected Parties		Date of comments received	Issues raised	EAPs response to issues as mandated by the applicant	Consultation Status (consensus dispute, not finalised, etc.)
Name of Individual	**Consulted**				
Municipal councillor					
No comments received to date.					
Municipality					
Joshua Hlapa Lephalale Local Municipality	Public Meeting	22-Oct-15	In the studies is there any waste management component? Will you do a site clearance?	A waste management licence has been applied for waste manage activities triggered in terms of GN R 921 of the NEM:WA, such as the overburden dump. General and Hazardous waste falls outside of the triggers for a waste management licence and will be dealt with in accordance with the Norms and Standards for Storage of Waste, 2013. These standards require that: ▪ A waste storage facility must be constructed to maintain on a continuous basis a drainage and containment system capable of collecting and storing all runoff water arising from the storage facility in the event of a flood. The system must under the said rainfall event, maintain a freeboard of half a meter; and ▪ A liquid waste storage area must have a secondary containment system (e.g. bund, drip tray) of a capacity which can contain at least 110% of the maximum contents of the waste storage facility. Where more than one container or tank is stored, the bund must be capable of storing at least 110% of the largest tank or 25% of the total storage capacity, whichever is greater (in the case of drums the tray or bund size must be at least 25% of total storage capacity). Site clearance will take place in preparation of the open pit and infrastructure development. The site clearance activities will be kept to a minimum and the topsoil removed will be located outside of the floodplain of the Limpopo River to act as a berm.	Resolved
Madibana Jeremia Lephalale Local Municipality	Public Meeting	22-Oct-15	Rather make use of dirty water than groundwater for the operations.	Raw water will be supplied by the adjacent Boikarabelo Coal Mine. This water will be sourced from the Marapong Treatment Works as part of the Marapong Boikarabelo Effluent Transfer project. Groundwater that may seep into the open pit will be dewatered for the continued operations and safety of the employees during mining operations. This water will be stored in the PCDs and/or used for dust suppression on site.	Consensus
EM Tukakgomo Lephalale Local Municipality	Focus Group	30-Oct-15	How was the SLP submitted without any consultation with the	Since the focus group meeting held on 30 October 2015, WOC has presented the SLP to the Lephalale Local Municipality on	Finalised

Interested and Affected Parties		Date of comments received	Issues raised	EAPs response to issues as mandated by the applicant	Consultation Status (consensus dispute, not finalised, etc.)
Name of Individual	**Consulted**				
Municipal Manager	Meeting		Local Municipality?	24 November 2015. Following the meeting with the Municipality, the SLP was updated and submitted to the DMR on 21 December 2015.	
EM Tukakgomo Lephalale Local Municipality Municipal Manager	Focus Group Meeting	30-Oct-15	The proposed project can't come to the area without acknowledging Local Municipality and local community.	WOC will engage further with the LLM with regards to the overall project and proposed LED project included in the SLP.	Consensus
Moloko Jack Maeko Lephalale Local Municipality Mayor	Focus Group Meeting	30-Oct-15	Considering the current situation we expect the Directors of Waterberg One Coal Mine to come and present to us; this meeting cannot continue as such.	WOC will engage further with the LLM with regards to the overall project and proposed LED project included in the SLP.	Consensus
Joshua Hlapa Lephalale Local Municipality	Public Meeting	23-Feb-16	Local Municipality proposes a cradle to grave approach for waste management.	Segregation will take place at the source, all recyclable waste will be managed through the Boikarabelo Coal Mine waste management facility. There will be no landfill site. Hydrocarbons will be stored in bunded areas and deposited at a licenced site.	Resolved
Organisations of state (Responsible for Infrastructure that may be affected Roads Department, Eskom, Telkom, DWA etc.)					
Phindile Mnguni Transnet	Written Comment	28-Sep-15	Please advise if there are any railway lines around the proposed area. Will the project have any potential impacts on our operations (i.e. is there any TFR or railway line activities or line nearer (500m) to the proposed development?	The Project area is located on the southern border of the Limpopo River and Botswana, approximately 55 km northwest from the town of Lephalale. There are no major roads or railway lines servicing the Project area or within 500 m of the Project area. Environmental authorisation has been granted for a proposed railway line for the adjacent Boikarabelo Coal Mine and will run in an easterly direction along the Steenbokpan-Lephalale Road (D1675) where it will join the existing main line to Grootegeluk Coal Mine. This railway line is under construction.	Resolved
Freddy Chebi LEDA	Public Meeting	22-Oct-15	On what basis or when will the coal be sold or provided to Boikarabelo?	The coal will be provided on a Free of Mine basis during the operation of the project.	Resolved
Freddy Chebi LEDA	Public Meeting	22-Oct-15	Where will water be sourced from?	The water to be used by Kubu Coal Mine will be supplied by Boikarabelo Coal Mine.	Consensus
Azwi Nelwamondo TCTA	Public Meeting	23-Feb-16	There are potential cumulative impacts from the mines in the area considering Boikarabelo also.	WOC is committed to a rehabilitation forum and to partake in a strategic assessment WBOC asked the DMR to make a recommendation on the collective forum for impacts.	Resolved
Communities					
Ditlhariso Mochambi Ward Committee	Public Meeting	22-Oct-15	How will the community be helped should they be relocated and find a place to stay?	There are no land occupiers within the Kubu Coal Mine Project site. The nearest receptors are located along the eastern extent of the Project boundary. The receptors are within the 500 m blast radius of the open pit. Discussions will be held	Consensus

Interested and Affected Parties		Date of comments received	Issues raised	EAPs response to issues as mandated by the applicant	Consultation Status (consensus dispute, not finalised, etc.)
Name of Individual	Consulted				
				with the land owner, including the land occupiers, prior to the commencement of any activities taking place on site.	
Ditlhariso Mochambi Ward Committee	Public Meeting	22-Oct-15	Will there be skills development for the community? Because education levels are low.	The Kubu Coal Mine has a SLP which details LED and training requirements for the affected communities.	Resolved
Jeremia Lesedi Community Member					
Albert Majudibodu Community Member	Public Meeting	22-Oct-15	When you start in 2019 and in terms of skills development; what will you do for the community prior the commencement of the proposed mine?	Once the Mining Right is granted the skills development programmes outlined in the SLP will be initiated.	Resolved
Traditional Leaders					
No comments received to date.					
Department of Land Affairs					
No comments received to date.					
Department of Environmental Affairs					
No comments received to date.					
Other Competent Authorities Affected					
Felicia Nemathaga Department of Water and Sanitation	Public Meeting	22-Oct-15	Considering a water quality programme; how are you going to monitor this on an ongoing basis?	The Surface Water and Groundwater Impact Assessments have provided recommended monitoring programmes. The water monitoring programmes are also detailed in Section 9.1, Part B of this report and will also be detailed in the IWULA.	Resolved
Felicia Nemathaga Department of Water and Sanitation	Public Meeting	22-Oct-15	What is the depth of the water table in the open pit?	The water level for the project area ranged from 6.6 mbgl to 39.9 mbgl as detailed in 9.8.2 of this EIA report.	Resolved
Kama Meso Department of Water and Sanitation	Public Meeting	22-Oct-15	You indicated that water will be taken from Boikarabelo; is this for the extra life of the mine?	The water supply to Kubu Coal Mine will not exceed the life of mine of the Boikarabelo Coal Mine.	Consensus
Dikeledi Baloyi Department of Water and Sanitation	Public Meeting	23-Feb-16	What is the groundwater impact from the mine, does the closure planning include treatment of water?	The potential impacts to the groundwater are provided in the EIA and EMP Report, however a numerical model must be developed specific to Kubu Coal Mine as a condition for authorisation. The closure planning has taken into account the treatment of water; the finanical provision has been calcultated according to the DMR Guideline Document for the Evaluation of the Quantum of Closure-Related Financial Provision Provided by a Mine.	Resolved

Table 8-6: Other Affected Parties

Other Affected Parties		Date of comments received	Issues raised	EAPs response to issues as mandated by the applicant	Section and paragraph reference in this report where the issues and/or responses were incorporated
Name of Individual	Consulted				
No comments received to date.					

Table 8-7: Interested Parties

Interested Parties		Date of comments received	Issues raised	EAPs response to issues as mandated by the applicant	Section and paragraph reference in this report where the issues and/or responses were incorporated
Name of Individual	Consulted				
Filomone Swanepoel Exxaro Resources	Written Comment	19-Oct-15	There are no directly impact due to the location, however, long term combined impacts of mining on the entire area needs to be considered.	Cumulative impacts have been qualitatively assessed as part of this EIA. The cumulative impacts of the development of entire Waterberg Coal Field have not been assessed, however, as this needs to be done at a strategic level.	Consensus
Filomone Swanepoel Exxaro Resources	Written Comment	19-Oct-15	Need to be aware of proximity to the river and wetlands.	The wetlands on site have been delineated and a 100 m buffer from the wetlands has been incorporated into the mine plan. In addition, all infrastructures and the open pit have been placed outside of the 1:100 year flood line. The location of the wetlands and rivers are well known within the Project area.	Consensus

9 Item 3(g)(iv): The Environmental Attributes Associated with the Development Footprint Alternatives

This section describes the baseline environmental conditions prior to the proposed Project commencing. Furthermore, this section also contains a description of the current land uses and specific environmental features relevant to the Kubu Coal Mine Project area.

9.1 Air Quality and Climate

An Air Quality Impact Assessment has been undertaken for the Project and is included in Appendix D.

9.1.1 Climate

Site specific MM5 modelled meteorological data was obtained from Lakes Environmental for the Project area for three calendar years from 2012 to 2014. The modelled data is used to determine local prevailing weather conditions and consists of surface data, as well as upper air meteorological data.

9.1.1.1 Wind Speed and Distribution

One of the factors that favour the suspension of loose particulates in the atmosphere is the intensity of the wind speed. The predominant wind direction for the Project area occurred from the northeast and east northeast for 30.2% and 23.5% of the modelled period, respectively. During the period between 2012 and 2014, wind speeds greater than 5.4 m per second occurred for 9.2% of time, calm conditions (wind speeds less than 0.5 m per second) occurred for 4.9% of the time and the average wind speed was 3.2 m per second for the period. The surface wind rose is illustrated in Figure 9-1, with the wind class frequency distribution shown in Figure 9-2.

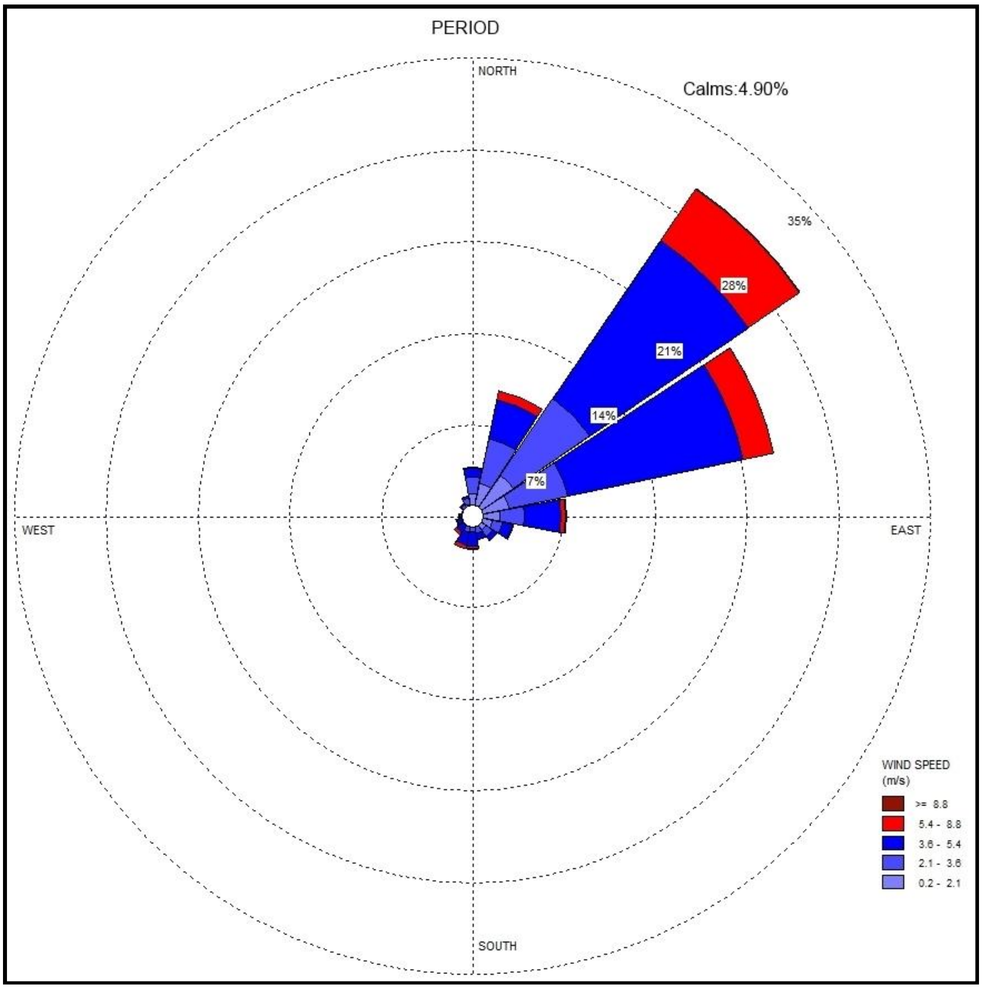


Figure 9-1: Surface Wind Rose for the Proposed Kubu Coal Mine Project Area (Modelled Data, 2012 to 2014)

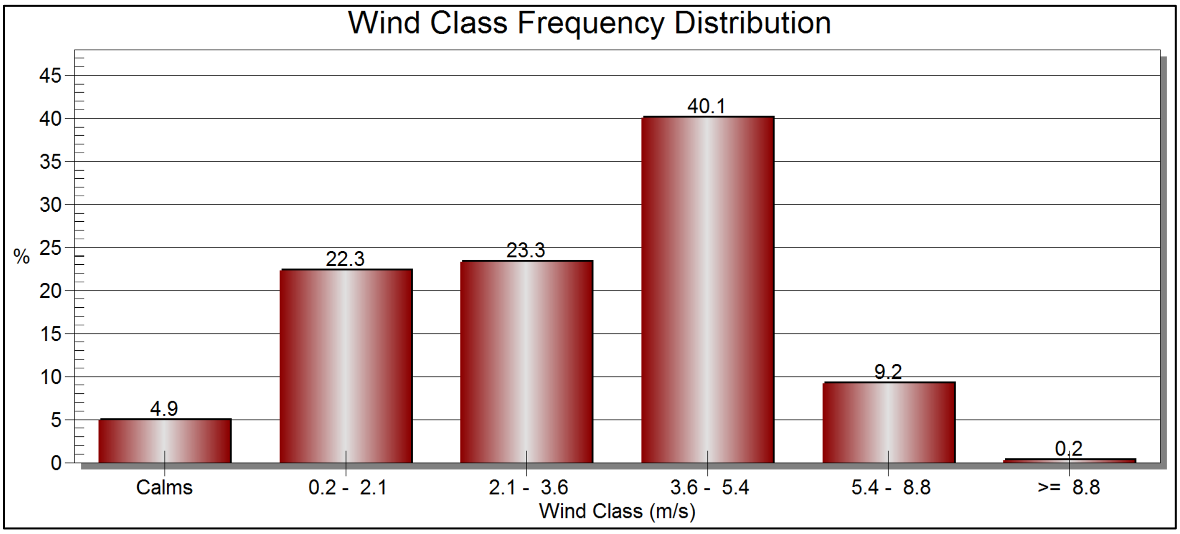


Figure 9-2: Wind Class Frequency Distribution

The diurnal patterns during the night, morning and evening hours were similar, with the dominant winds occurring from the northeast and east, with the afternoon winds predominantly from the northeast. Strong winds greater than 5.4 m per second were observed 18% of the time during the morning hours (06:00 to 12:00). Calm conditions in the morning occurred 4% of the time, 10% of the time in the afternoon, with the calm conditions occurring in the evening and night time for 4.10% and 1.69% of the time respectively. Average wind speeds were 3.80 m per second in the morning (06:00 to 12:00), 2.43 m per second in the afternoon (12:00 to 18:00), 3.13 m per second in the evening (18:00 to 24:00) and 3.61 m per second during the night time (00:00 to 06:00). The diurnal patterns are displayed in Figure 9-3.

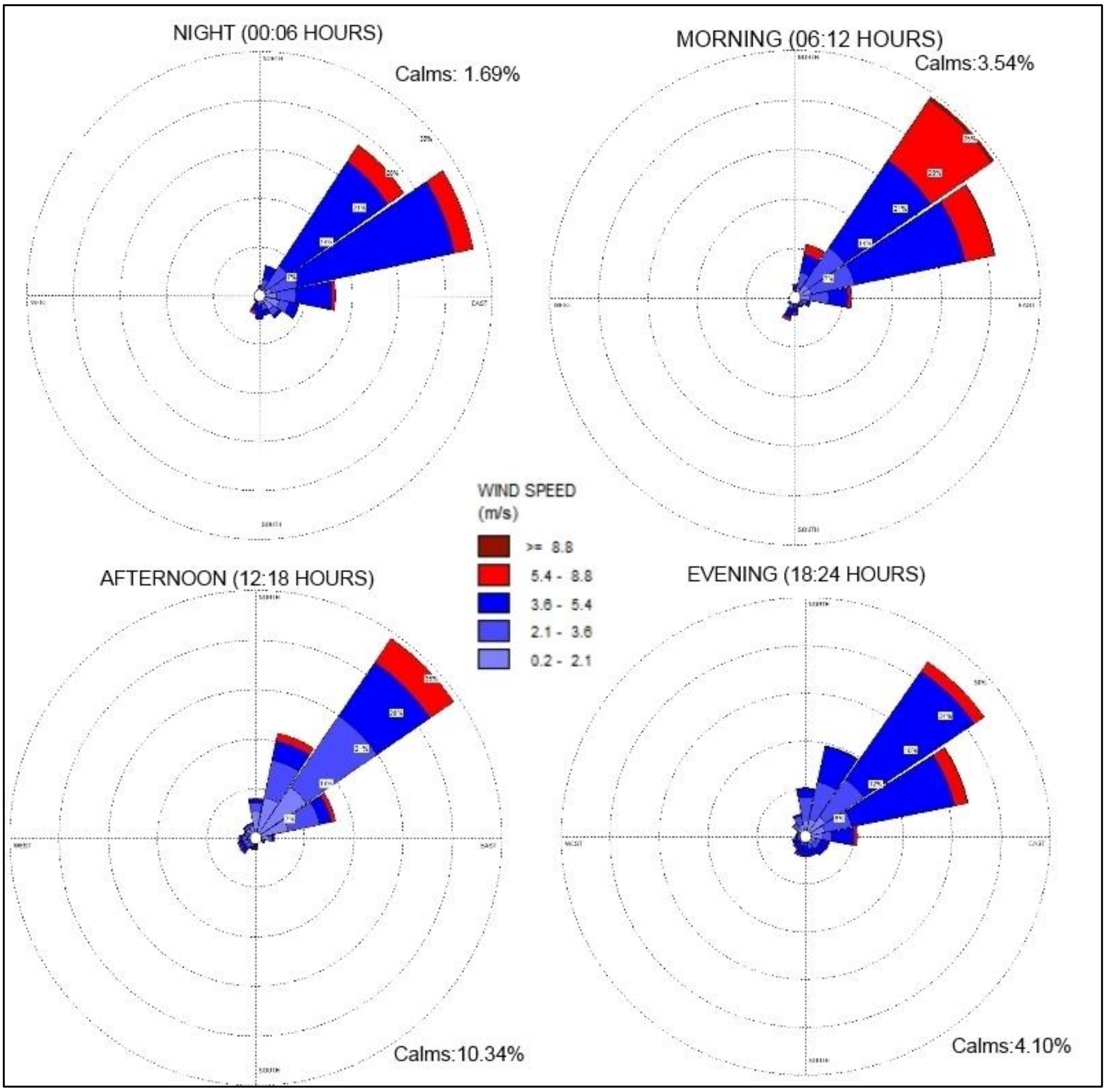


Figure 9-3: Diurnal Variation for the Project Area for Night Time (00:00 to 06:00), Morning (06:00 to 12:00), Afternoon (12:00 to 18:00) and Evening (18:00 to 24:00) (Modelled Data, 2012 to 2014)

The seasonal patterns (Figure 9-4) show spring to have been dominated by winds from the northeast (39.5% of the modelled period) with wind speed greater than 5.4 m per second observed 19% of the time. Summer was dominated by winds from the northeast and east northeast for 33.3% and 26.2% of the modelled period respectively, with wind speeds greater than 5.4 m per second occurring for 8.8% of the time. Autumn and winter were also dominated by winds from the northeast and east northeast, with wind speeds greater than 5.4 m per second occurring for 4.2% and 5.1% of the time respectively.

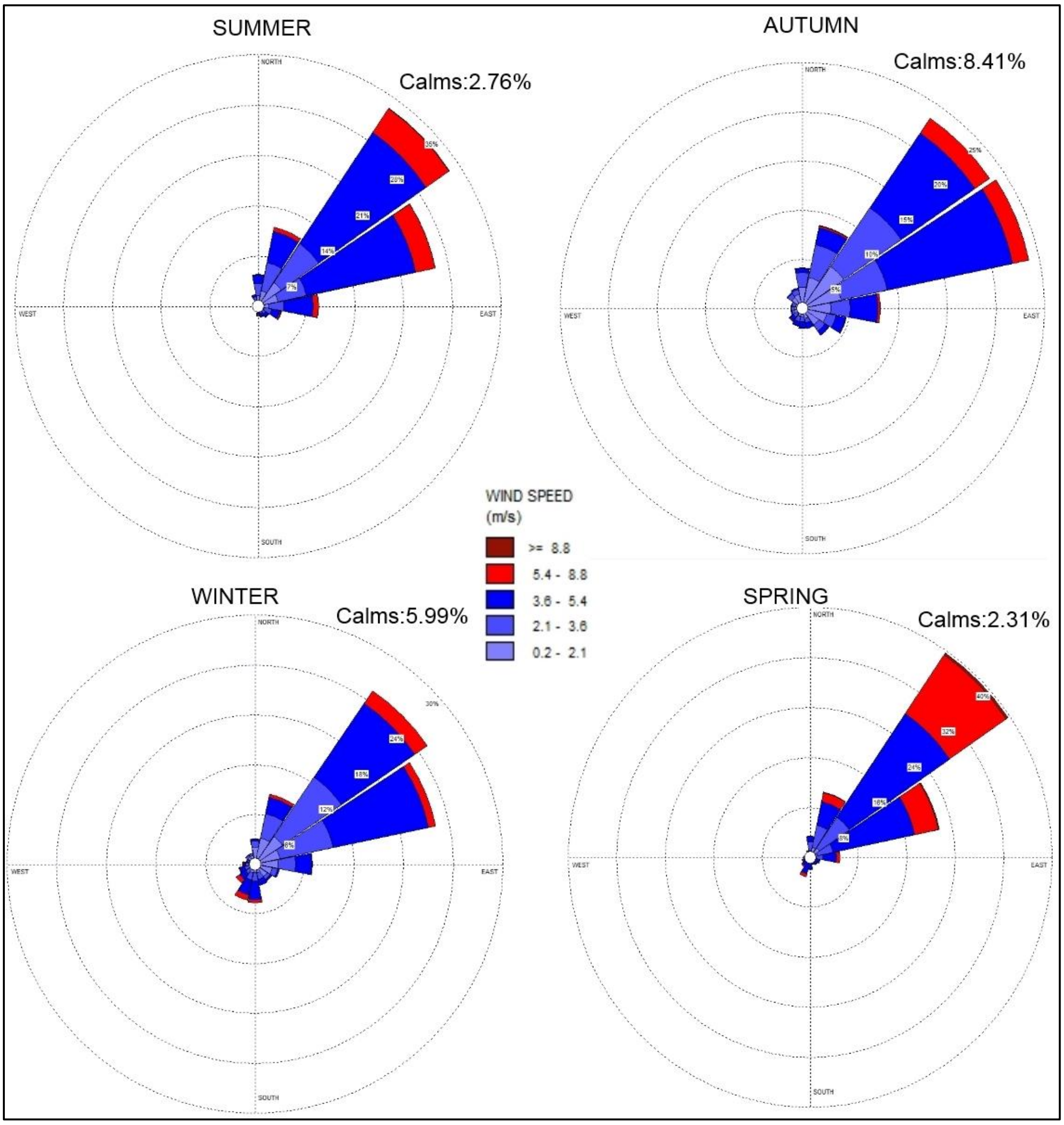


Figure 9-4: Seasonal Variation of Winds for Summer (December to February), Autumn (March to May), Winter (June to August) and Spring (September to November) (Modelled Data, 2012 to 2014)

Wind speed greater than 5.4 m per second, which is capable of eroding loose dust, will occur at an average of 31 days in a year, based on the modelled data. Table 9-1 indicates the monthly average and maximum wind speed for the Project area, with the highest recorded wind speeds for the three year period recorded as 11.4 m per second.

Table 9-1: Monthly Average and Maximum Wind Speeds (Modelled Data, 2012 to 2014)

Wind Speed (m per second)	January	February	March	April	May	June	July	August	September	October	November	December	Annual Average
Monthly Maximum	8.7	8.1	9.1	11.4	8.3	9.1	7.5	8.8	9.5	9.9	10.5	11.2	9.3
Monthly Average	3.5	3.6	3.4	3.0	2.3	2.7	2.7	3.6	3.8	4.5	4.2	3.7	3.4

9.1.1.2 Temperature

The monthly maximum and average temperatures for the period 2012 to 2014 are detailed in Table 9-2. The monthly maximum temperatures range from 23.9°C in July to 35.5°C in November, with the monthly average temperatures ranging between 12.7°C in July to 25.9°C in January and February. The annual average temperature for the Project area was 20.4°C.

Table 9-2: Average Monthly and Maximum Temperature (Modelled Data, 2012 to 2014)

Temperature (°C)	January	February	March	April	May	June	July	August	September	October	November	December	Annual
Monthly Maximum	34.1	34.6	34.0	31.1	28.0	24.9	23.9	28.2	31.6	33.8	35.5	33.9	31.1
Monthly Average	25.9	25.9	24.1	19.7	16.1	13.1	12.7	15.5	19.6	22.0	25.0	25.5	20.4

9.1.1.3 Relative Humidity

The monthly average and maximum relative humidity for the Project area is summarised in Table 9-3. The monthly average relative humidity is in excess of 50% throughout the year, with the highest average humidity observed in June and July with 75%. The annual average relative humidity was 63% for the modelled period.

Table 9-3: Average Monthly Relative Humidity for the Project Area (Modelled Data, 2012 to 2014)

Relative Humidity (%)	January	February	March	April	May	June	July	August	September	October	November	December	Annual
Monthly Maximum	100	99	100	100	100	100	100	100	100	100	97	99	100
Monthly Average	57	56	57	61	68	75	75	69	67	61	54	58	63

9.1.1.4 Precipitation

The total and average monthly precipitation for the proposed Kubu Coal Mine for the three year period between 2012 and 2014 is provided in Table 9-4. The highest total monthly precipitation for the modelled period was observed for December with 144 mm of rain recorded, with 0 mm of precipitation recorded in June. The annual total precipitation was recorded as 692 mm (Lakes Environmental), with an annual monthly average of 44 mm of precipitation.

Table 9-4: Total and Average Monthly Precipitation for the Project Area (Modelled Data, 2012, to 2014)

Precipitation (mm)	January	February	March	April	May	June	July	August	September	October	November	December	Annual
Total Monthly Precipitation (Maximum)	141	73	47	48	1	0	1	3	19	82	135	144	692
Average Monthly Precipitation	93	60	21	1	0	0	0	0	19	82	74	129	44

9.1.1.5 Evaporation

The maximum, minimum and average evaporation rates were sourced from the South African Weather Services for the period 1983 to 1987 for Lephalale, which is located 55 km southeast of the Project site. The annual maximum, minimum and average evaporation rates for the period were 2 662 mm, 2 119 mm and 2 365 mm respectively. The highest monthly maximum evaporation rates occurred in January (310.8 mm), with the minimum evaporation rate occurring in July (100 mm). The monthly minimum evaporation rates range from 88 mm in June to 241 mm in January, as indicated in Table 9-5.

Table 9-5: Maximum, Minimum and Average Monthly Evaporation Rates for Lephalale (South African Weather Services, 1983 to 1987)

Evaporation (mm)	January	February	March	April	May	June	July	August	September	October	November	December	Annual
Minimum	241	229	200	167	117	88	99	147	186	235	196	214	2 119
Maximum	311	256	221	224	144	123	101	191	253	263	330	245	2 662
Average	268	240	208	196	130	103	100	164	215	244	266	232	2 365

9.1.2 Air Quality

9.1.2.1 Dust Fallout Baseline

Dust deposition data is relevant to the assessment of background air quality, as it shows monthly, seasonal, and sometimes inter-annual variability in dust fallout rates – pre and during the operational phase of the mine. The amount of dust collected at any given time is a function of the rate of deposition, which may vary widely depending on meteorological factors such as wind speed and direction and availability of erodible sources. The dust fallout sampling, analyses, comparison and interpretation was conducted according to the SANS 1137:2012, Collection and Measurement of Dust fallout standards.

The acceptable dust fallout rates were published in the National Dust Control Regulation (NDCR) 2013, in terms of Section 32 and Section 53 of the NEM:AQA. The dust fallout standards for residential and non-residential areas are listed in Table 9-6.

Table 9-6: Acceptable Dust Fallout Rates

Restriction Areas	Dust Fallout Rate ($mg/m^2/day$; 30-Day Average)	Permitted Frequency of Exceeding Dust Fallout Rate
Residential Area	D < 600	Two within a year, not sequential months
Non-Residential Area	600 < D < 1200	Two within a year, not sequential months

Dust monitoring has been undertaken for the adjacent Boikarabelo Coal Mine during the course of 2014 and 2015, with the sampling locations displayed in Plan 5, Appendix A and in Table 9-7. Due to the extensive dust fallout monitoring, this information was utilised to provide a baseline for the Project area. The dust deposition rates predominantly fall within the fallout rates for both residential and non-residential areas, with only three exceedances of the residential rates observed in 2014 at monitoring site DM05 in January and sites DM10 and DM 11 in December; monitoring site DM10 was flagged as the content of the bucket may have been rendered inoperative due to the excessive dust fallout rate. As a result, monitoring site DM10 has not been provided in Figure 9-5. Deposition rates were available until May 2015, with the only exceedance of the residential rates occurring in January at monitoring site DM02. The exceedance is expected to have occurred due to natural causes as no mining activities have been undertaken in the area associated with Boikarabelo Coal Mine. The 2014 and 2015 dust fallout deposition rates are illustrated in Figure 9-5 and Figure 9-6 respectively, as well as provided in Table 9-8 and Table 9-9.

Table 9-7: Dust Monitoring Locations

Site ID	Site Description	Latitude	Longitude
DM01	Kruishout (Offices)	23° 38' 58.030" S	27° 9' 32.530" E
DM02	Boompan (Lodge)	23° 36' 18.330" S	27° 6' 54.770" E
DM03	Zeekeoivlei (Residence)	23° 36' 25.990" S	27° 8' 4.550" E
DM04	Swellpan	23° 36' 19.810" S	27° 11' 11.773" E
DM05	Kruishout	23° 37' 33.958" S	27° 11' 30.314" E
DM06	Zeekeoivlei	23°37'29.06"S	27° 7'20.79"E
DM07	Maluma Lodge	23°38'57.91"S	27° 6'4.46"E
DM08	Witkopje	23°35'25.25"S	27° 8'1.47"E
DM09	Wilderbeestvlakte	23°39'22.86"S	27°13'42.29"E
DM10	Vischpan	23°40'6.14"S	27° 7'24.14"E
DM11	Kamiesbult	23°40'55.07"S	27°12'57.39"E

Table 9-8: Dust Fallout Rates for the Boikarabelo Coal Mine for 2014

Dust levels (mg/m²/day, 30 day average)												
	Jan	**Feb**	**Mar**	**Apr**	**May**	**Jun**	**Jul**	**Aug**	**Sep**	**Oct**	**Nov**	**Dec**
DM01	127	64	21	74	176	102	58	72	61	126	67	95
DM02	89	143	7	28	17	33	31	35	55	81	83	123
DM03	97	37	38	80	82	67	48	37	76	132	115	120
DM04	238	76	67	26	53	39	32	26	55	81	65	234
DM05	**822**	343	277	69	72	42	39	22	74	90	117	171
DM06	32	86	134	31	118	96	57	31	55	121	149	68
DM07	40	*	36	115	76	81	29	45	52	69	46	*
DM08	35	68	90	80	61	27	37	32	62	63	436	86
DM09	140	77	224	60	66	84	43	38	88	76	196	91
DM010	399	29	12	62	97	64	43	28	35	79	291	**7 440**
DM011	69	96	45	44	79	77	33	34	5	76	74	**939**

* denotes no data. Concentrations highlighted in red exceed the residential NDCR limits of 600 mg/m^2/day.

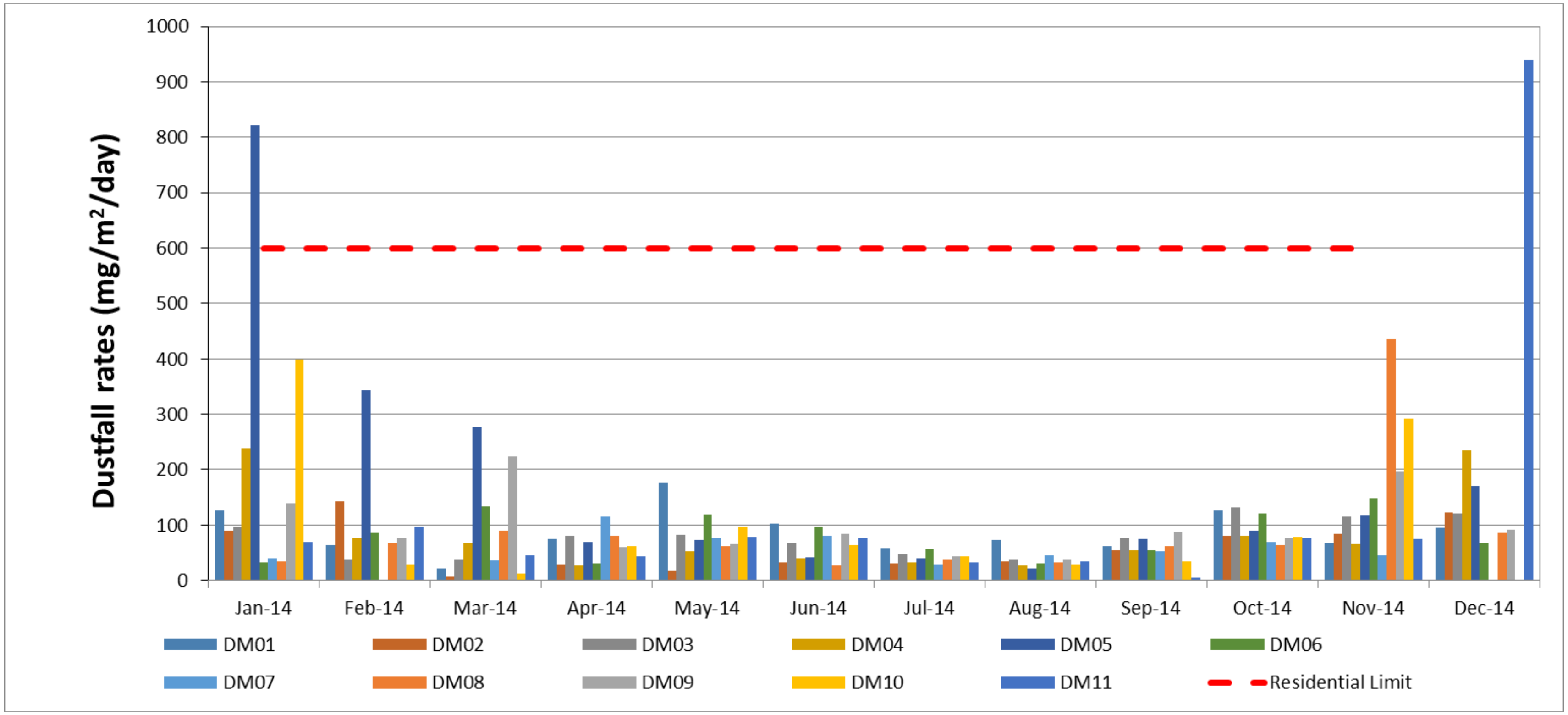


Figure 9-5: Dust Fallout Rates for the Boikarabelo Coal Mine for 2014

Table 9-9: Dust Fallout Rates for the Proposed Boikarabelo Coal Mine for 2015

Dust levels (mg/m^2/day, 30 day average)					
	Jan	Feb	Mar	Apr	May
DM01	77	105	66	48	61
DM02	**648**	43	36	43	51
DM03	62	48	47	49	60
DM04	78	69	38	30	51
DM05	102	21	76	30	40
DM06	134	36	42	33	32
DM07	107	*	49	60	*
DM08	75	43	36	26	29
DM09	54	252	40	35	40
DM010	52	51	53	29	57
DM011	123	66	59	54	63

* denotes no data. Concentrations highlighted in red exceed the residential NDCR limits of 600 mg/m^2/day.

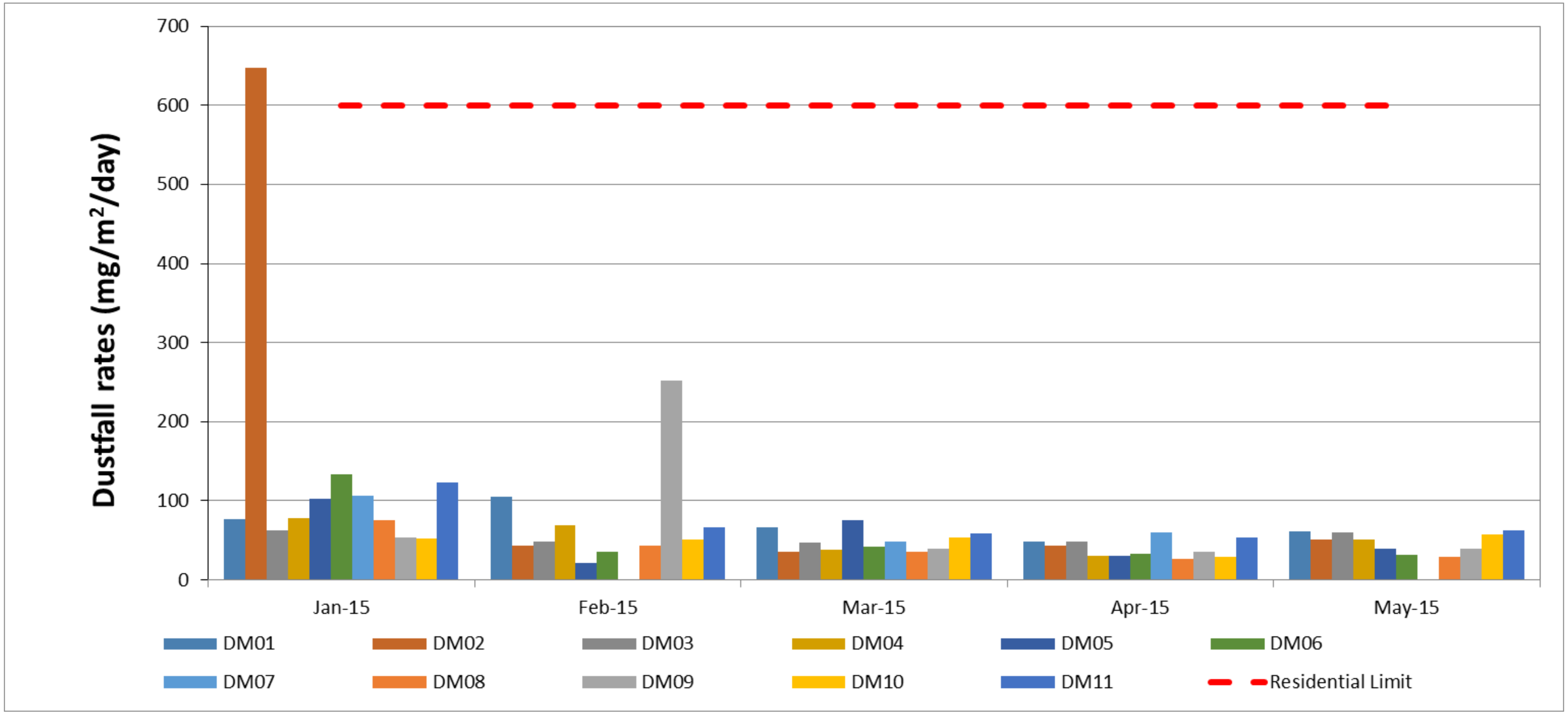


Figure 9-6: Dust Fallout Rates for the Proposed Boikarabelo Coal Mine for 2015

9.1.2.2 Particulate Matter Baseline

Site specific baseline information was not available for Particulate Matter (PM) with a size of 2.5 microns ($PM_{2.5}$) and 10 microns (PM_{10}); data measured at the Waterberg Bonjala Priority Area monitoring station in Lephalale, owned by the DEA and hosted by the South African Air Quality Information System (SAAQIS), was used to assess background air quality for the region. The National Ambient Air Quality Standards (NAAQS) was established in accordance with the NEM:AQA and provides standards for pollutants and PM, with the standards for $PM_{2.5}$ and PM_{10} provided in Table 9-10 and Table 9-11, respectively. The daily concentrations of $PM_{2.5}$ were within the current South African standard of 65 µg/m^3, with no exceedances observed during the period 2012 to 2015 (Figure 9-7). The PM_{10} levels were generally within the NAAQS standard of 75 µg/m^3, with a number of exceedances observed in November 2012 and October 2013 (Figure 9-8).

Table 9-10: National Ambient Air Quality Standards for $PM_{2.5}$

National Ambient Air Quality Standard for Particulate Matter ($PM_{2.5}$)			
Averaging Period	**Concentration**	**Frequency of Exceedance**	**Compliance Date**
24 hours	65 µg/m^3	4	Immediate – 31 December 2015
24 hours	40 µg/m^3	4	1 January 2016 – 31 December 2029
24 hours	25 µg/m^3	4	1 January 2030
1 year	25 µg/m^3	0	Immediate – 31 December 2015
1 year	20 µg/m^3	0	1 January 2016 – 31 December 2029
1 year	15 µg/m^3	0	1 January 2030
The reference method for the determination of the $PM_{2.5}$ fraction of suspended particulate matter shall be EN 14907.			

Table 9-11: National Ambient Air Quality Standards for PM_{10}

National Ambient Air Quality Standard for Particulate Matter (PM_{10})			
Averaging Period	**Limit Value (µg/M^3)**	**Frequency of Exceedance**	**Compliance Date**
24 hour	75	4	1 January 2015
1 year	40	0	1 January 2015
The reference method for the determination of the PM_{10} fraction of suspended particulate matter shall be EN 12341.			

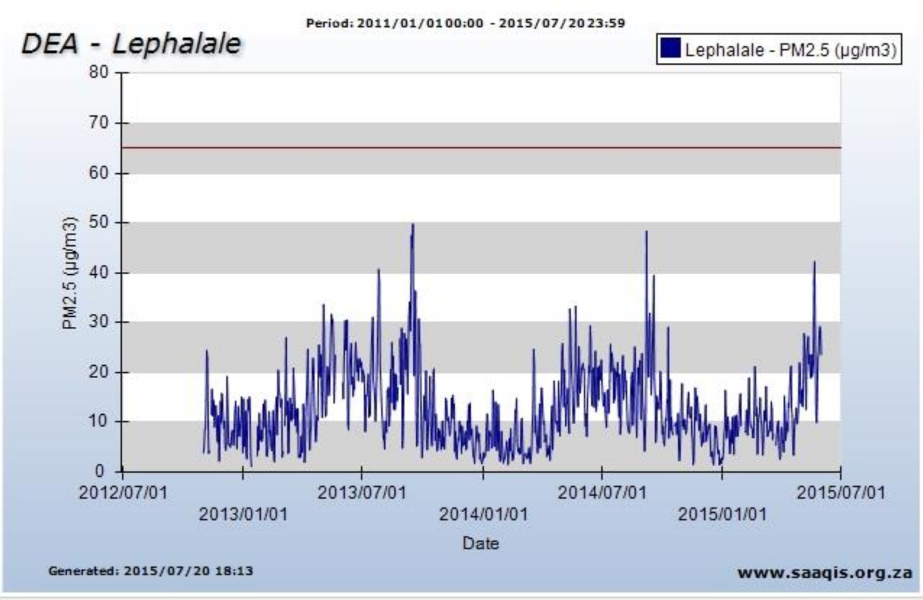


Figure 9-7: $PM_{2.5}$ levels at Lephalale Air Quality Management System (2012 to 2015)

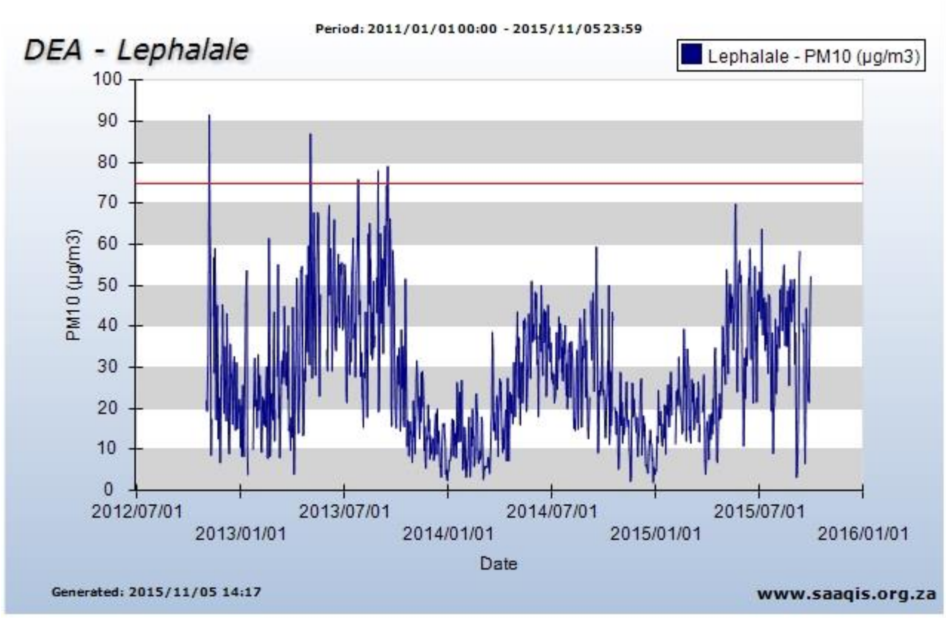


Figure 9-8: PM_{10} levels at Lephalale Air Quality Management System (2012 to 2015)

9.2 Topography

The topography is considered to be flat, with undulating plains which slopes to the north and west. The elevation of the Project area ranges between 1 000 m above mean sea level (mamsl) and 800 mamsl. The northern section of the Project area is dominated by the Limpopo River and its floodplain and is very flat, with slopes less than 1% in a northerly direction. The centre of the Project area is undulating with outcrops of higher elevation. These areas are more resistant to erosion than the surrounding soils due to the underlying Calcrete geology. The topography in the southern extent of the Project area flattens out to less than 1% slope percentage. The flat topography of the area is unlikely to provide any natural screens from visual receptors in the region.

9.3 Soil, Land Use and Land Capability

The Soil, Land Use and Land Capability Impact Assessment Report is attached as Appendix E.

9.3.1 Soil Types

Several soil forms are present within the Project area, with the different soil forms located in various portions of the Project area. Soil mapping was undertaken to delineate the various soil forms associated with the proposed Kubu Coal Mine, with the soil types delineated in Plan 6, Appendix A.

Slight depressions and crests occur within the Project area. The crests consist of carbonate, with the depressions consisting of deeper, red soil. The red soils represent the Hutton or Kimberley soil forms; Hutton soil consists of an orthic A-horizon that overlies a red apedal B-horizon, with the Kimberley soil form characterised by an orthic A-horizon underlain by an apedal B-horizon and soft carbonate. The deeper soils within the Project area are predominantly Hutton soils, with the shallow soils being predominantly of the Kimberley soil form. The Hutton soil form is approximately 0.8 m or more in depth.

The southern crests of the Project area are predominantly of carbonate origin, with the northern crests close to the Limpopo River consisting of shale. Soil depths on the crests are very shallow with a depth of approximately 0.3 m or less. The Kimberley soil form dominates the landscape where carbonate crests are prevalent, with shallow, stony Glenrosa soils found in the north where shale is present.

The Limpopo River floodplain consists of structured, heavy clay soils that represent the Valsrivier and Arcadia soil forms. The Valsrivier soil form has an orthic A-horizon and a pedocutanic B-horizon, with the Arcardia soil form being characterised by strong vertic soil properties. The soil types are delineated in Plan 6, Appendix A, with an example of the Hutton, Kimberley, Glenrosa and Valsrivier soils provided in Figure 9-9.

	
A	**B**
	
C	**D**

Figure 9-9: Examples of the Soil Forms within the Project Area: A) Kimberley Soil Form; B) Glenrosa Soil Form; C) Hutton Soil Form; and D) Valsrivier Soil Form

9.3.1.1 Soil Properties

Selective soil samples were analysed to determine the chemical and physical properties of the soil forms. The Fertilizer Society of South Africa, 2007, provides guidelines for healthy soil macro nutrient ranges to determine the fertility of soils, as provided in Table 9-12. The chemical and physical properties of selective soils samples are provided in Table 9-13 and indicate that the soils are characterised by naturally low phosphorus (P) levels, thus, indicating soils of very low fertility. Sodium concentrations for all samples were below the *high* soil fertility guidelines, with majority of the samples also below the *high* soil fertility guidelines for calcium, magnesium and phosphorus. The pH of the soil samples were considered to be slightly alkaline to neutral.

Table 9-12: Soil Fertility Guidelines

Element	Low (mg per kg)	High (mg per kg)
Calcium (Ca)	<200	>3000
Magnesium (Mg)	<50	>300
Potassium (K)	<40	>250
Phosphorus (P)	<5	>35
Sodium (Na)	<50	>200

pH (KCl)					
Very Acid	**Acid**	**Slightly Acid**	**Neutral**	**Slightly Alkaline**	**Alkaline**
<4	4.1-5.9	6-6.7	6.8-7.2	7.3-8	>8

Source: Fertilizer Society of South Africa, 2007

Table 9-13: Chemical and Physical Properties of Selective Soil Samples

Sample Point	Soil Form	Depth (cm)	Org C (%)	CEC cmol(+)kg^{-1}	K (mg per kg)	Ca (mg per kg)	Mg (mg per kg)	Na (mg per kg)	P (mg per kg)	pH	Sand (%)	Silt (%)	Clay (%)
S1	Hutton	0 - 30	0.4	6.98	64	720	50	2	0.27	7.14	83.3	2.7	14
S2	Hutton	0 - 30	0.96	11.84	176	4565	105	2	1	8.53	65.9	14.1	20
S3	Valsrivier	0 - 30	0.78	3.51	526	5116	1534	81	0.08	8.33	17.2	24.8	58
S4	Hutton	0 - 30	0.8	6.99	196	753	85	1	26.7	7.08	87.7	2.3	10
S5	Hutton	0 - 30	0.48	4.59	215	732	119	5	7.4	7.21	79.2	4.8	16
S6	Arcadia	0 - 30	0.82	38.44	412	5248	1935	129	1.9	8.06	10.2	27.8	62
S7	Hutton	0 - 30	0.48	4.83	133	625	91	1	12.4	7.52	87.0	5	8
S8	Hutton	0 -30	0.43	3.79	64	265	49	1	13.6	6.46	79.6	8.4	12

9.3.2 Land Capability

Land capability is defined by the most intensive, long term sustainable use of land under rain fed conditions. The land capability has been determined by the soil types identified on site. The rocky areas are classified as Class VI, moderate grazing potential. Hutton soils are usually associated with moderate cultivation, although due to climatic conditions this has been reduced to Class VI as the soil capabilities will not reach their potential.

Thus, the dominant land capability for the Project area is Class VI which is classified as non-arable, moderate grazing potential. The limited land capability and agricultural potential is due to the unfavourable climatic conditions resulting in severe limitations that make it unsuitable for cultivation and restricts grazing by wildlife. The Project area is currently impacted upon due to overgrazing and there is limited ground cover on site. This has resulted in exposed soil throughout the Project area which results in reduced available habitat, erosion and wind-blown dust.

The land capability for the Kubu Coal Mine Project area is depicted in Plan 7, Appendix A.

9.3.3 Land Use

The predominant land use in the region is dominated by grazing due to the low arable agricultural potential; game grazing is dominant within the Project area. Although the surrounding land use is predominantly game farming, the region has been identified as a Potential Development Area; the Steenbokpan mining node. The development of the mining node is evident, with the establishment of the Boikarabelo Coal Mine being adjacent to Kubu Coal Mine, as well as numerous other proposed mining developments in the surrounding region. The SDF for the Waterberg region is discussed in Section 7, with the Waterberg SDF illustrated in Figure 7-1.

9.4 Fauna and Flora

The Fauna and Flora Impact Assessment is included in Appendix F.

9.4.1 Flora

9.4.1.1 Regional Vegetation

The proposed Kubu Coal Mine falls within the Limpopo Sweet Bushveld (Mucina and Rutherford, 2006) as illustrated in Plan 8, Appendix A, with this vegetation unit occurring at an altitude between 700 and 1 000 mamsl. The vegetation unit extends across the border into Botswana and consists of plains and short, open woodland. Disturbed areas are dominated by thickets of Blue Thorn (*Acacia erubescens*), Black Thorn (*Acacia mellifera*) and Sickle Bush (*Dichrostachys cinerea*). This vegetation type is classified as Least Threatened and approximately 5% of the vegetation type has been transformed according to Mucina and Rutherford (2006).

Important vegetation categories include tall trees, tall shrubs, low shrubs and succulent herbs (Mucina and Rutherford, 2006). Tall trees include Ankle Thorn (*Acacia robusta*) and Black Monkey Thorn (*Acacia burkei*), with smaller trees including *Acacia erubescens*, *Acacia fleckii, Acacia nilotica, Acacia senegal, Albizia anthelmintica, Boscia albitrunca, Combretum apiculatum,* and *Terminalia sericea.* Common and characteristic species of the Limpopo Sweet Bushveld are listed in Table 9-14.

Table 9-14: Common and Characteristic Species of the Limpopo Sweet Bushveld Vegetation Unit

Limpopo Sweet Bushveld	
Tall Trees:	*Acacia robusta, A. burkei*
Small Trees:	***Acacia erubescens****, A. fleckii, A. nilotica, A. senegal var. rostrata, Albizia anthelmintica,* ***Boscia albitrunca****, Combretum apiculatum, Terminalia sericea.*
Tall Shrubs:	*Catophractes alexandri,* ***Dichrostachys cinerea****, Phaeoptilum spinosum, Rhigozum obovatum,* ***Cadaba aphylla,*** *Combretum hereroense, Commiphora pyracanthoides, Ehretia rigida subsp. rigida, Euclea undulata,* ***Grewia flava, Gymnosporia senegalensis***
Low Shrubs:	*Acacia tenuispina, Commiphora africana, Felicia muricata, Gossypium herbaceum subsp. africanum, Leucosphaera bainesii.*
Graminoids:	*Digitaria eriantha subsp. eriantha, Enneapogon cenchroides, Eragrostis lehmanniana, Panicum coloratum,* ***Schmidtia pappophoroides****,* ***Aristida congesta,*** *Cymbopogon nardus, Eragrostis pallens, E. rigidior, E. trichophora, Ischaemum afrum, Panicum maximum, Setaria verticillata, Stipagrostis uniplumis,* ***Urochloa mosambicensis***
Herbs:	*Acanthosicyos naudinianus, Commelina benghalensis, Harpagophytum procumbens subsp. transvaalense, Hemizygia elliottii,* ***Hermbstaedtia odorata****, Indigofera daleoides*
Succulent Herbs:	*Kleinia fulgens, Plectranthus neochilus.*

Species in **bold** have been recorded during field visits.

9.4.1.2 Site Specific Vegetation Communities

Two primary vegetation communities were distinguished within the Project area, with the vegetation delineation provided in Plan 9, Appendix A. The list of plant species observed throughout the Project area is provided in Appendix F, and includes results from surveys undertaken in 2008 and 2015. The vegetation has been delineated into the *Acacia mellifera* Mixed Thornveld Woodland and the *Ziziphus mucronata* Riparian Woodland communities, with the latter vegetation community restricted to the northern extent of the Project area.

The *Acacia mellifera* Mixed Thornveld includes *Acacia erubescens* (Blue Thorn), *Acacia tortilis* (Umbrella Thorn) and Sheperd's Tree (*Boscia albitrunca*) as the dominant upper strata, with the grass layers comprising a mixture of *Aristida* and *Eragrostis* spp. Disturbed areas, due to overgrazing activities, have been dominated by native invader species such as the Black Thorn and Sickle Bush; these species occur within disturbed areas within each delineated vegetation community. Ground cover was below 50% due to the overgrazing activities. An example of the *Acacia mellifera* Mixed Thornveld is illustrated in Figure 9-10.

Figure 9-10: *Acacia mellifera* Mixed Thornveld

The *Ziziphus mucronata* Riparian Mixed Thornveld was found on the main channel of the Limpopo River and its tributaries. The mixed thornveld's upper strata was dominated by *Ziziphus mucronata*, *Combretum imberbe* and *C. erythrophyllum* (Red River-Bushwillow), with the grass layer comprised predominantly of *Aristida congesta congesta* and *Schmidtia pappophoroides*.

9.4.1.3 Species of Special Concern

Plant Species of Special Concern (SSC) include species listed as Red Data according to the national list published by the South African National Biodiversity Index (SANBI), as well as species that are provincially or nationally protected. Protected species have been listed in the Protected Species, Schedule 12 of the LEMA and the National Protected Trees Lists (2012) of the National Forests Act, 1998 (Act No. 84 of 1998). The plant SSC for the Project area is provided in Table 9-15.

Table 9-15: Plant Species of Special Concern

Family	Species	Common Name	Threat Status	Likelihood of Occurrence
Combretaceae	*Combretum imberbe*	Leadwood	Nationally Protected	Recorded in *Ziziphus mucronata* Riparian Woodland
Fabaceae	*Acacia erioloba (now Vachellia erioloba)*	Camel Thorn	Nationally Protected Red Data:	Recorded in *Acacia mellifera* Mixed Thornveld

Family	Species	Common Name	Threat Status	Likelihood of Occurrence
			Declining	
Capparaceae	*Boscia albitrunca*	Shepherd's Tree	Nationally Protected	Recorded in *Acacia mellifera* Mixed Thornveld

9.4.1.4 Medicinal Plants

South Africa has a rich diversity of medicinal plants that have a cultural and historic role. During the surveys conducted in 2008 and 2015, 24 plant species were recorded that are officially recognised as having medicinal value, with a further 7 species having a cultural value. The medicinal and cultural plants observed on site are listed in Table 9-16.

Table 9-16: Medicinal and Cultural Plants within the Project Area

Scientific Name	Common Name	Use	Form
Acacia erioloba	Camel thorn	Medicinal	Tree
Acacia karoo	Sweet thorn	Medicinal	Tree
Acacia nilotica	Scented thorn	Medicinal	Tree
Acacia tortilis	Umbrella thorn	Medicinal	Tree
Asparagus africanus	Bush asparagus	Medicinal	Herb
Asparagus laricinus	Cluster leaved asparagus	Charm	Herb
Asparagus setaceus	-	Charm	Herb
Barleria saxatilis	-	Cultural	Herb
Becium obovatum	Cat's Whiskers	Medicinal	Herb
Boscia albitrunca	Shepherds tree	Medicinal	Tree
Brunsvigia radulosa	-	Medicinal	Herb
Cadaba aphylla	Leafless wormbush	Medicinal	Shrub
Combretum hereroense	Russet Bushwillow	Medicinal	Tree
Combretum imberbe	Leadwood	Medicinal	Tree
Commelina africana	Yellow Commelina	Medicinal	Herb
Cucumis zeyheri	Wild cucumber	Medicinal	Herb
Dichrostachys cinerea	Sickle bush	Medicinal	Tree
Faidherbia albida	Ana Tree	Medicinal	Tree
Grewia flava	Velvet Raisin	Medicinal	Tree
Gymnosporea senegalensis	Red Spike Thorn	Medicinal	Shrub
Indigofera hedyantha	Black bud indigo	Medicinal	Herb
Ipomoea bolusiana	Narrow leaved Pink Ipomoea	Cultural	Herb
Lantana rugosa	Birds Brandy	Medicinal	Herb
Ledebouria ovatifolia	-	Medicinal	Bulb/Herb
Peltophorum africanum	Weeping wattle	Medicinal	Tree
Polygala amatymbica	Dwarf Polygala	Medicinal	Herb
Schoenoplectus corymbosus	-	Cultural-weaving	Reed
Solanum panduriforme	Yellow Bitter-apple	Medicinal	Shrub

Scientific Name	Common Name	Use	Form
Ximenia americana	Blue Sourplum	Cultural	Tree
Ximenia caffra	Sourplum	Edible, traditional	Tree
Ziziphus mucronata	Buffalo thorn	Medicinal	Tree

9.4.1.5 Alien Invasive Plant Species

Invasion of vegetation communities by alien plants decreases the biodiversity of the environment, erodes the natural capital of ecosystems and compromises their stability. Alien plant species in South Africa are categorised according to the Alien and Invasive Species List, 2014, of the National Environmental Management: Biodiversity Act, 2004 (Act No. 10 of 2004) (NEMBA). The alien invasive plant species recorded on site were classified as Category 1b species, which requires control through the development and implementation of an alien invasive management programme. The alien invasive vegetation on site with a Category 1b classification is provided in Table 9-17.

Table 9-17: Alien Invasive Vegetation with a Category 1b Classification

Family	Species	Common name	Category
Amaranthaceae	*Achyranthes aspera*	Burweed	1b
Asteraceae	*Flaveria bidentis*	Smelter's bush	1b
	Xanthium strumarium	Large cocklebur	1b
Papaveraceae	*Argemone ochroleuca*	Mexican poppy	1b
	Argemone mexicana	Mexican poppy	1b
Poaceae	*Pennisetum clandestinum*	Kikuyu grass	1b
Solanaceae	*Solanum sisymbriifolium*	Wild tomato	1b

9.4.2 Fauna

Faunal SSC are considered to be vital for the conservation of biodiversity. The South African Red Data list uses the same criteria as defined by the International Union for the Conservation of Nation (IUCN). According to the IUCN, all species are classified into 9 groups, as described in Table 9-18. The Red Data faunal species for the Project area are presented below based on these Red Data categories.

Table 9-18: Red Data Categories

Category		Description
Extinct	**(EX)**	No known individuals remaining.
Extinct in the Wild	**(EW)**	Known only to survive in captivity.
Critically Endangered	**(CR)**	Extremely high risk of extinction in the wild.

Category		Description
Endangered	**(EN)**	High risk of extinction in the wild
Vulnerable	**(VU)**	High risk of endangerment in the wild.
Near Threatened	**(NT)**	Likely to become endangered in the near future.
Least Concern	**(LC)**	Lowest risk. Does not qualify for a more at risk category.
Data Deficient	**(DD)**	Not enough data to make an assessment of its risk of extinction.
Not Evaluated	**(NE)**	Has not yet been evaluated against the criteria.

Source: South African National Biodiversity Index, 2012

9.4.2.1 Avifauna and Important Bird Areas

A total of 123 bird species were observed for the Project site during the 2008 and 2015 surveys, with the list of birds provided in Appendix F. The project area is unique from an avifaunal perspective as it falls within the transition area between the dry western African region and the sub-tropical eastern African region, giving rise to a number of interesting avifaunal species. Furthermore, the Limpopo River system contains many species from east and central Africa that have reached their southern limit, and therefore the Project site and surrounds offer a suite of range-restricted birds. A total of 8 bird SSC were observed for the Project area and are listed in Table 9-19.

Table 9-19: Bird Species of Special Concern for the Project Area

Scientific Name	Common Name	IUCN Status	Survey Observed	
			2008	2015
Terathopius ecaudatus	Bateleur	NT		x
Ardeotis kori	Kori Bustard	NT	x	x
Rostratula benghalensis	Greater Painted Snipe	LC	x	
Buphagus erythrorhynchus	Red-billed Oxpecker	LC	x	x
Ephippiorhynchus senegalensis	Saddle-billed Stork	LC		x
Mycteria ibis	Yellow–billed Stork	LC	x	x
Gyps africanus	White-backed Vulture	EN	x	x

The South African Important Bird Area (IBA) Programme is coordinated by BirdLife South Africa and aims to identify and protect a network of sites at a biogeographical scale that are critical for the long term viability of naturally occurring bird populations. The nearest IBA to the Project area is the Waterberg System, which is situated in excess of 50 km south of the proposed Kubu Coal Mine. Globally threatened bird species associated with the Waterberg IBA, which may occur within the Project area, include Cape Vulture *(Gyps coprotheres)*, Secretarybird *(Sagittarius serpentarius)*, Martial Eagle *(Polemaetus bellicosus)* and Southern Ground-Hornbill *(Bucorvus leadbeateri*). Regionally threatened birds include White-backed Night Heron *(Gorsachius leuconotus)*, Lanner Falcon *(Falco biarmicus)*, African Grass Owl

(Tyto capensis), Tawny Eagle *(Aquila rapax),* African Finfoot *(Podica senegalensis)* and Half-collared Kingfisher *(Alcedo semitorquata)*.

9.4.2.2 Mammals

The Koert Louw Zyn Pan farm is currently operated as a game farm and contains large mammals that are naturally occurring as well as having been introduced, such as Blue Wildebeest (*Connochaetes taurinus taurinus*), Waterbuck (*Kobus ellipsiprymnus ellipsiprymnus*), Kudu (*Tragelaphus strepsiceros*) and Gemsbok (*Oryx gazella*). The Project area is suited to host a variety of predatory species such as the Leopard (*Panthera pardus*), Cheetah (*Acinonyx jubatus*), Brown Hyena (*Hyaena brunnea*) and Black-backed Jackal (*Canis mesomelas*). All mammals that may occur within the Project area are listed in Appendix F. The mammal species observed on site during the 2008 and 2015 surveys, as well as the IUCN status, are listed in Table 9-20.

Four SSC were previously observed in the study area, namely the Leopard (*Panthera pardus*), White Rhinoceros *(Ceratotherium simum)*, Honey Badger (*Mellivora capensis*) and Sable Antelope (*Hippotragus niger niger*), all of which have been allocated an IUCN conservation status of near threatened; these mammals are also provincially protected under the Limpopo Environmental Management Act, 2003 (Act No. 7 of 2003). The Blue Wildebeest was observed during both 2008 and 2015 surveys and is nationally protected according to NEMBA.

Table 9-20: Mammal Species Observed within the Project Area

Family	Species	English name	Status	Observation Method
Rhinocerotidae	*Ceratotherium simum*	White Rhinoceros	NT	Recorded
Bovidae	*Syncerus caffer*	Cape Buffalo	LC	Recorded
Bovidae	*Aepyceros melampus*	Impala	LC	Recorded
Bovidae	*Connochaetes taurinus taurinus*	Blue Wildebeest	NEMBA Protected	Recorded
Bovidae	*Sylvicapra grimmia*	Grey /Common Duiker	LC	Recorded
Bovidae	*Alcelaphus buselaphus*	Red Hartebeest	LC	Recorded
Equidae	*Equus burchellii*	Plains Zebra	LC	Recorded
Bovidae	*Hippotragus niger niger*	Sable Antelope	VU	Recorded
Bovidae	*Tragelaphus strepsiceros*	Kudu	LC	Recorded
Bovidae	*Tragelaphus scriptus*	Bushbuck	LC	Recorded
Bovidae	*Kobus ellipsiprymnus ellipsiprymnus*	Waterbuck	LC	Recorded
Bovidae	*Raphicerus campestris*	Steenbok	LC	Recorded

Family	Species	English name	Status	Observation Method
Bovidae	*Oryx gazella*	Gemsbok	LC	Recorded
Canidae	*Canis mesomelas*	Black-backed Jackal	LC	Recorded
Cercopithecidae	*Cercopithecus aethiops pygerythrus*	Vervet Monkey	LC	Recorded
Cercopithecidae	*Papio ursinus*	Chacma Baboon	LC	Spoor
Felidae	*Panthera pardus*	Leopard	NT	Spoor
Herpestidae	*Galerella sanguinea*	Slender Mongoose	LC	Recorded
Herpestidae	*Mungos mungo*	Banded Mongoose	LC	Recorded
Hippopotamidae	*Hippopotamus amphibius*	Hippopotamus	LC	Spoor
Hystricidae	*Hystrix africeaustralis*	Porcupine	LC	Spoor
Leporidae	*Lepus saxatilis*	Scrub/Savannah Hare	LC	Spoor
Mustelidae	*Mellivora capensis*	Honey Badger	NT	Spoor
Orycteropodidae	*Orycteropus afer*	Aardvark/Ant bear	LC	Spoor
Pedetidae	*Pedetes capensis*	Springhare	LC	Spoor
Sciuridae	*Paraxerus cepapi*	Tree Squirrel	LC	Recorded
Sciuridae	*Xerus inauris*	Cape Ground Squirrel	LC	Recorded
Suidae	*Phacochoerus africanus*	Warthog	LC	Recorded

A bat assessment was undertaken by WildSkies Ecological Services on behalf of Boikarabelo Coal Mine in 2012. Considering range and habitat requirements, it is possible that 23 bat species occur in the region. Only one Vulnerable bat species occurs in the area, along with three Near Threatened bat species; although all four species may occur in the region, only one species was confirmed using all identification (*Miniopterus natalensis* – Natal Long-fingered Bat) (WildSkies, 2012). The remaining potentially occurring bat species are all considered of Least Concern.

9.4.2.3 Herpetofauna

Habitat within the Project area is well suited to harbour a variety of reptile and amphibian species (collectively termed herpetofauna); the close proximity to the Limpopo River allows for easy migration between water and land. Appendix F lists herpetofauna species that may occur on site. A single herpetofauna SSC was recorded on site, namely the Nile Crocodile (*Crocodylus niloticas*), which is regarded as Vulnerable (VU) according to NEMBA. Although not recorded during the specialist studies, the presence of Puff Adders (*Bitis arientans*) and Black Mambas (*Dendroaspis polylepis*) have also been recorded in the region.

9.4.2.4 Invertebrates

No Baboon Spiders were observed within the Project area during the site survey, although the habitat associated with the Project area is conducive to harbouring this species and they have been observed in the properties adjacent to Koert Louw Zyn Pan. South Africa has a rich diversity of baboon spiders, represented by eight genera and 44 sub species of which 35 are endemic to the region. They belong to the family *Theraphosidae.* In addition, previous surveys within the area identified nine butterfly species, none of which were Red Data species.

9.4.3 Limpopo Critical Biodiversity Area

The Limpopo Critical Biodiversity Areas (CBAs) assessment is a bioregional conservation plan. The CBAs were selected based on their biodiversity characteristics, spatial configuration and requirement for meeting targets for both biodiversity pattern and ecological processes. Sites that have been categorised as CBA 1 are regarded as irreplaceable and the conservation of these areas is imperative to meet the biodiversity targets of the Limpopo CBAs. The Project area overlies areas that have been delineated as part of the Limpopo CBAs, with irreplaceable CBA 1 categories delineated throughout majority of the Project area, as illustrated in Plan 10, Appendix A. The remainder of the site is categorised as CBA 2 which is considered as optimal areas that should be maintained in their natural state.

9.4.4 Ecological Sensitivity

The ecological sensitivity of the Project area ranges from medium-low to high sensitivity, as illustrated in Plan 11, Appendix A. The biodiversity assessment, together with the Limpopo CBA assessment and national spatial environmental conservation tools were used to determine the ecological sensitivity of the Project area. The areas associated with the tributary of the Limpopo River, namely the delineated *Ziziphus mucronata* Riparian Woodland, were determined to have a high ecological sensitivity, with the areas associated with the *Acacia mellifera* Mixed Thornveld determined to have a medium-low ecological sensitivity. The open pit and infrastructure associated with the Project is restricted to the medium-low ecological sensitivity of the *Acacia mellifera* Mixed Thornveld.

9.5 Aquatics

The Aquatics Impact Assessment is included in Appendix G.

The Project area is located within the Limpopo Water Management Area (WMA1) and within quaternary catchment A41E. The Limpopo River borders the northern extent of the Project area, with a meander arm tributary of the Limpopo River located within the Project site. According to Ashton *et al.* (2001), the Limpopo River was a strong historical perennial system which is now a dryland river with surface flow ceasing entirely in the winter dry season (LBTPC, 2010). It must be noted that the results for the aquatic ecosystems discussed below are based on sampling results undertaken during 2015, as well as monitoring data undertaken since 2013.

Based on the Freshwater Ecosystem Priority Areas (FEPAs) (WRC, 2011), the Project area and river reach are not considered to be FEPAs and are, therefore, considered to be Upstream Management Areas. Upstream Management Areas are regions that require management to improve and maintain downstream FEPAs (WRC, 2011). A description of the Class categories is detailed in Table 9-21, with a summary of the status of the A41E quaternary catchment, based on desktop data (DWA, 2013), provided in Table 9-22.

Table 9-21: Class Category Descriptions

Category	Description
A	Unmodified, natural.
B	Largely natural with few modifications. A small change in natural habitats and biota may have taken place but the ecosystem functions are essentially unchanged.
C	Moderately modified. A loss and change of natural habitat and biota have occurred but the basic ecosystem functions are still predominantly unchanged.
D	Largely modified. A large loss of natural habitat, biota and basic ecosystem functions has occurred.
E	The loss of natural habitat, biota and basic ecosystem functions is extensive.
F	Modifications have reached a critical level and the lotic system has been modified completely with an almost complete loss of natural habitat and biota. In the worst instances the basic ecosystem functions have been destroyed and the changes are irreversible.

Table 9-22: Desktop Status of Quaternary Catchment A41E

Component / Catchment	A41E-00126
Present Ecological Status	Class C
Ecological Importance Class	High
Ecological Sensitivity	High
Default Ecological Category	Class B

The desktop Present Ecological Status (PES) is Class C or moderately modified. The moderately modified status of the ecology associated with this river reach is due to overgrazing, trampling and sedimentation, inundation and abstraction activities. The desktop ecological importance and sensitivity of the Project site is considered as high due to the species richness within the river reach and sensitive vertebrate and invertebrate species present for the sub quaternary reach.

The baseline aquatic ecology for the Project site was determined based on high flow aquatic monitoring undertaken in 2015, with the sampling sites indicated in Plan 12, Appendix A.

9.5.1 Water Quality

The water quality results for the high flow assessment are summarised in Table 9-23 and compared to the Department of Water Affairs and Forestry (DWAF) Aquatic Ecosystems guidelines (1996). Constituents highlighted in red indicate where the DWAF Aquatic Ecosystems guidelines (1996) have been exceeded.

Table 9-23: *In Situ* Water Quality Results Compared Against the DWAF Aquatic Ecosystems Guidelines (1996)

Site	Temperature (°C)	pH	Conductivity (µS per cm)	Dissolved Oxygen (mg per litre)	Dissolved Oxygen (% saturation)
Guideline	**5-30**	**6-9**	**<700**	**>5**	**60-120**
LED1	26	7.6	364	5.3	68
LED2	25	7.7	311	5.4	66
LED3	29	7.6	1 812	3.1	54
LED4	27	7.7	960	3.8	59
*Red denotes constituent exceeding recommended guideline					

The results of the 2015 survey show water temperatures ranging between 25 ºC and 29 ºC. The pH was shown to range slightly from 7.6 at sampling sites LED1 and LED3 to 7.7 at sampling sites LED2 and LED4. Conductivity results showed larger fluctuations between 311 µS/cm and 1 812 µS/cm at sampling sites LED2 and LED3 respectively. Dissolved oxygen concentrations ranged from 3.1 mg per litre at sampling site LED3 to 5.4 mg per litre at sampling site LED2, with dissolved oxygen saturation levels ranging from 54% to 68%. Sampling sites LED3 and LED4 exceeded the DWAF Aquatic Ecosystems Guidelines (1996) for conductivity, dissolved and saturated oxygen levels. The concentrations of dissolved solids and oxygen for LED3 and LED4 exceed the recommended guidelines but are considered to be natural and a result of evaporation and subsequent concentrations of the meander arm. The concentrations for monitoring sites LED1 and LED2 are within the recommended guidelines and are associated with the Limpopo River, resulting in greater water volumes which may increase oxygen levels and dilute potential conductivity.

9.5.2 Intermediate Habitat Integrity Assessment

The Intermediate Habitat Integrity Assessment (IHIA) model was used to assess the integrity of the habitat from a riparian and instream perspective. The habitat integrity of a river refers to the maintenance of a balanced composition of physio-chemical and habitat characteristics on a temporal and spatial scale that are comparable to the characteristics of natural habitats of the region (Kleynhans, 1996). The classes are described in Table 9-21 above, with the results of the IHIA for the Project area summarised in Table 9-24. Based on the classification system for IHIA the instream habitat can be considered to be Class D (largely modified) with the riparian habitat associated with the sites being Class C (moderately modified); the loss of natural habitat, biota and ecosystem functions is significant within the region associated with the Project area.

Table 9-24: Summary of the IHIA for the Instream and Riparian Habitats

Habitat	Category
Instream	Class D
Riparian	Class C

9.5.3 Aquatic Macroinvertebrates

Aquatic macroinvertebrate assemblages are good indicators of localised conditions because many macroinvertebrates have sedentary characteristics with relatively long lives (approximately 1 year) (USEPA, 2006). Macroinvertebrates are useful for their ability to integrate pollution effects over time, their detectable response to environmental impacts and the easy field sampling techniques involved in their collection.

9.5.3.1 South African Scoring System

The South African Scoring System version 5 (SASS5) is the current index utilised to assess the status of riverine macroinvertebrates in South Africa. According to Dickens and Graham (2002), the index is based on the presence of aquatic invertebrate families and the perceived sensitivity to water quality changes of these families. SASS5 results are expressed both as an index score (SASS score) and the Average Score Per recorded Taxon (ASPT value).

Despite attempts to sample aquatic invertebrates at sampling sites, no invertebrates were observed or were able to be collected at LED3 and LED4. For this reason, the sites were not included in the invertebrate assessment. The SASS5 score obtained at LED1 was 62 with 13 taxa present resulting in an ASPT of 4.7. LED1 and LED2 were located within close proximity to each other and on the same stretch of the Limpopo River; the results for both LED1 and LED2 are expected to be similar. As a result, only the results of LED1 have been presented below. Considering the biological banding, the site fell within a Class D or largely modified. The results for the SASS5 assessment are summarised in Table 9-25.

Table 9-25: SASS5 Results for the High Flow Period for the Project Site

Site	LED1
Taxa	62
ASPT	13
SASS5	4.7
Class	D

9.5.3.2 Integrated Habitat Assessment System

The Integrated Habitat Assessment System (IHAS) aims to summarise and reflect the quantity, quality and diversity of biotopes available for aquatic biota to inhabit a sampling site (McMillan, 1998). Although the IHAS requires field validation, the method is seen as useful for the quantification of available aquatic habitat at a site and therefore has been retained in this study. However, the IHAS has recently been shown to structure unreliable scores in regard to habitat suitability often producing varying results between geomorphological zones and biotype groups. Due to this limitation the results of the IHAS assessment should be taken into consideration with caution. The IHAS scoring description is included in Table 9-26, with the results listed in Table 9-27.

Table 9-26: Description of IHAS Scores and Descriptions

IHAS Score (%)	Description
>75	Very Good
65–74	Good
55–64	Fair/Adequate
<55	Poor

Table 9-27: Integrated Habitat Assessment System

Site	LED1
Flow	Moderate
Clarity (cm)	37
Score	44
Suitability	Poor

9.5.3.3 Macroinvertebrate Response Assessment Index

The objective of the Macroinvertebrate Response Assessment Index (MIRAI) is to provide a habitat-based cause-and-effect base to interpret the deviation of the aquatic invertebrate community from the reference condition. The MIRAI does not exclude the calculation of the SASS 5 scores (Thirion, 2007). The results for the MIRAI are summarised in Table 9-28.

Table 9-28: MIRAI Results for the Project Area

Site	LED1
MIRAI %	67
Category	C

9.5.4 Fish Response Assessment Index

Fish are long living and respond to various drivers as they are continuously exposed to aquatic conditions. As a result, fish can be used to determine ecological disturbances as they give an indication into the degree of modification of the aquatic environment. The Fish Response Assessment Index (FRAI) score is based upon the preferences of various fish species and the frequencies of their occurrence.

The information gained using the FRAI gives an indication of the present ecological state of the aquatic ecosystems, based on the fish assemblage structures observed. Fish species were then compared to those species that were expected to be present for A41E quaternary catchment. The overall FRAI for the associated reach of the Limpopo River assessed was found to be largely natural/moderately modified, as summarised in Table 9-29.

Table 9-29: Fish Response Assessment Index Results

FRAI	Limpopo Reach
Score (Adjusted)	78.5
Category	B/C

9.5.5 Present Ecological Status

The PES of the reach of Limpopo River assessed is presented in Table 9-30. It should be noted that the PES has been calculated based on results for the river reach and therefore has taken the overall results from the previous surveys into consideration. Furthermore, the weighting for the biological responses has favoured the fish indices as a higher confidence can be placed in fish results for the 2015 period. Based on the results for the Ecostatus calculation (PES), the reach of the Limpopo River assessed during the 2015 period can be considered moderately modified or Class C; the aquatic habitats are no longer in their natural states and have been modified.

Table 9-30: Present Ecological Status of the Aquatic Ecosystems for the Project Area

Water Quality	C
Habitat Instream	D
Habitat Riparian	C
Macroinvertebrates	C
Fish	B/C
PES	C

9.6 Wetlands

The Wetlands Impact Assessment is included in Appendix H.

9.6.1 National Freshwater Ecosystem Priority Areas

The National Freshwater Ecosystem Priority Areas (NFEPA), which are strategic spatial priorities for conserving the country's freshwater ecosystems and supporting sustainable use of water resources, were considered to evaluate the importance of the wetland areas located within the Project area (Nel *et al*., 2011). NFEPAs include the wetland classification and ranking criteria as detailed in Table 9-31. The identified NFEPA wetlands on site have been ranked as 5 which indicated that the wetland has been identified as an area that will be a focus for rehabilitation. The Limpopo River has been allocated an NFEPA ranking of 4 indicating that it is nationally important and is in a good ecological state. Not all of the wetlands on site have been recorded as NFEPA wetlands, predominantly due to the desktop nature of the NFEPA assessment. The NFEPA wetlands are illustrated in Plan 13, Appendix A.

Table 9-31: NFEPA Wetland Classification Ranking Criteria

Criteria	Rank
Wetlands that intersect with a RAMSAR site.	1
Wetlands within 500 m of an IUCN threatened frog point locality; Wetlands within 500 m of a threatened water bird point locality; Wetlands (excluding dams) with the majority of their area within a sub-quaternary catchment that has sightings or breeding areas for threatened Wattled Cranes, Grey Crowned Cranes and Blue Cranes; Wetlands (excluding dams) within a sub-quaternary catchment identified by experts at the regional review workshops as containing wetlands of exceptional Biodiversity importance, with valid reasons documented; and Wetlands (excluding dams) within a sub-quaternary catchment identified by experts at	2

Criteria	Rank
the regional review workshops as containing wetlands that are good, intact examples from which to choose.	
Wetlands (excluding dams) within a sub-quaternary catchment identified by experts at the regional review workshops as containing wetlands of biodiversity importance, but with no valid reasons documented.	3
Wetlands (excluding dams) in A or B condition AND associated with more than three other wetlands (both riverine and non-riverine wetlands were assessed for this criterion); and Wetlands in C condition AND associated with more than three other wetlands (both riverine and non-riverine wetlands were assessed for this criterion).	4
Wetlands (excluding dams) within a sub-quaternary catchment identified by experts at the regional review workshops as containing Impacted Working for Wetland sites.	5
Any other wetland (excluding dams).	6

9.6.2 Wetland Delineation

The wetland delineation includes a floodplain wetland (riparian habitat), hillslope seep and unchannelled valley bottom wetlands. A buffer of 100 m has been placed around the wetland and riparian areas to facilitate the protection of the delineated wetland areas within the Project area as the wetlands are regarded as crucial for the sustainable development of the Waterberg (Mining Mirror, 2012). The proposed Kubu Coal Mine open pit has been developed taking into consideration the 100 m wetland buffer zone. The wetland delineation is illustrated in Plan 14, Appendix A; based on the wetland delineation, the open pit was reduced in size and a 100 m buffer implemented to avoid the wetland areas.

9.6.2.1 Wetland Units Description

Table 9-32 lists the wetland hydro-geomorphic (HGM) units and the relevant extents of the wetlands. Wetlands cover an area of 377.97 ha of the Project area, with 92% of the wetland areas attributed to the Limpopo River floodplain. The wetland HGMs are detailed further in Table 9-32.

Table 9-32: Wetland HGM Units and Areas

Wetland Type	Area	Proportion of Wetlands on Site (%)
Floodplain	349.28	92
Hillslope Seep	21.63	6
Valley bottom wetland	7.06	2
Total	**377.97**	**100**

9.6.2.1.1 Floodplain

The portion of the Limpopo River floodplain found on site was characterised by the main river channel, as well as the meandering arm that is gradually evolving to an oxbow lake. Flood attenuation is likely to be high early in the wet season (November to January) until the floodplain soils are saturated (McCartney, 2000 in Kotze *et al.,* 2005) and the meandering arm and other depressions are filled. The flood attenuation capacity is usually reduced in the late wet season. The floodplains are unlikely to contribute significantly to stream flow augmentation, as the clayey nature of the floodplain soils retains water which is likely to be lost through evapotranspiration.

9.6.2.1.2 Hillslope Seep

Hillslope seepage wetlands are usually associated with a perched groundwater table, where precipitation that occurs within the greater catchment is temporarily stored within the soil profile as a result of impervious strata in the soil profile. Hillslope seepage wetlands are expressed where the soil profile is shallow enough that the impervious strata layer and the water stored within the soil profile are expressed on the surface. Hillslope seepage wetlands are created and maintained by infiltration processes that occur in the surrounding non-wetland areas within the catchment.

9.6.2.1.3 Un-Channelled Valley Bottom

The valley bottom wetlands without channels are located at the lowest position in a landscape where the water drained from the local slopes accumulates. Water expressed in the hillslope seepage wetlands may also drain towards the valley bottom wetlands. These wetlands play important functions such as sediment trapping, flood attenuation and nutrient cycling. The valley bottom without a channel wetland on site receives extensive amounts of sediment and flow from the surrounding slopes. This allows an opportunity for contact between solute-laden water and the wetland vegetation, providing an opportunity for flood and contaminant (nutrients, pesticides, herbicides) attenuation. Extensive areas of these wetlands remain saturated as stream channel input is spread diffusely across the valley bottom, even at low flows (Kotze *et al.,* 2007). These wetlands also tend to have a high organic content.

9.6.3 Wetland Health and Integrity

9.6.3.1 Present Ecological Status

A PES analysis was conducted to establish baseline integrity (health) for the associated wetlands. To determine the integrity (health) of the characterised HGM units for the Project area, the WET-Health tool (Macfarlane *et. al.* (2007)) was utilised. According to Macfarlane *et. al.* (2007), the health of a wetland can be defined as a measure of the deviation of wetland structure and function from the wetland's natural reference condition. The PES of all non-floodplain wetlands are determined according to the criteria outlined in Table 9-33.

The Riparian Vegetation Response Assessment Index (VEGRAI) model was applied to assess the Limpopo River riparian habitat. The VEGRAI model, developed by Kleynhans *et al.* (2007), is designed for qualitative assessment of the response(s) of riparian vegetation to impacts so that qualitative ratings translate into quantitative and defensible results. The VEGRAI system provides an indication of the causes for riparian vegetation degradation and is also provided in Table 9-33.

Table 9-33: Present Ecological Status Categories for Wetlands

Description	Combined Impact Score (Macfarlane *et al.*, 2007)	Score (% of total) (Kleynhans *et al.*, 2007)	PES Category
Unmodified, natural.	0-0.9	90-100	A
Largely natural with few modifications. A slight change in ecosystem processes is discernible and a small loss of natural habitats and biota has taken place.	1-1.9	80-89	B
Moderately modified. A moderate change in ecosystem processes and loss of natural habitats has taken place but the natural habitat remains predominantly intact.	2-3.9	60-79	C
Largely modified. A large change in ecosystem processes and loss of natural habitat and biota has occurred.	4-5.9	40-59	D
Seriously modified. The change in ecosystem processes and loss of natural habitat and biota is great but some remaining natural habitat features are still recognisable.	6-7.9	20-39	E
Critically modified. Modifications have reached a critical level and ecosystem processes have been modified completely with an almost complete loss of natural habitat and biota.	8-10	0-19	F

The results of the wetlands assessment undertaken in 2008 determined that wetlands were allocated a PES of Class B and C (Digby Wells 2008), or largely natural to moderately modified. The current 2015 assessment determined that all non-riparian wetlands were allocated a PES of Class C, or moderately modified, and the Limpopo River floodplain was allocated a PES of Class D, or largely modified. The discrepancy may be attributable to increased grazing pressure; promoting the onset of erosion. Further to this, alien invasive vegetation establishment was prominent.

The Wet-Health assessment tool (Macfarlane *et. al.,* 2007) was used for the non-floodplain HGM units and the VEGRAI (Kleyhans et al., 2007) tool was used for the riparian floodplain unit. The PES of the wetland HGM units are provided in Table 9-34.

Table 9-34: Overall PES Scores for the Wetland HGM Units

HGM Unit	Method	PES Score	PES Class
Unchannelled Valley Bottom	WET-Health	3.9	C
Seepage Wetland		2.9	C
Limpopo River Riparian Habitat	VEGRAI	46.0	D

9.6.3.2 Ecological Importance and Sensitivity

To assess the importance of wetlands identified on site from an ecological perspective, taking into account aspects related solely to the maintenance of ecological diversity and functionality, the Ecological Importance and Sensitivity (EIS) tool was used. The EIS categories are detailed in Table 9-35, with the EIS scores for the wetland HGM units provided in Table 9-36.

Table 9-35: Ecological Importance and Sensitivity Categories

Ecological Importance and Sensitivity	Range of Median	Recommended Ecological Management Class[13]
Very high Floodplains that are considered ecologically important and sensitive on a national or even international level. The biodiversity of these floodplains is usually very sensitive to flow and habitat modifications. They play a major role in moderating the quantity and quality of water of major rivers.	>3 and ≤4	A
High Floodplains that are considered to be ecologically important and sensitive. The biodiversity of these floodplains may be sensitive to flow and habitat modifications. They play a role in moderating the quantity and quality of water of major rivers.	>2 and ≤3	B
Moderate Floodplains that are considered to be ecologically important and sensitive on a provincial or local scale. The biodiversity of these floodplains is not usually sensitive to flow and habitat modifications. They play a small role in moderating the quantity and quality of water of major rivers.	>1 and ≤2	C

[13] Ed's note: Author to confirm exact wording for version 1.1

Ecological Importance and Sensitivity	Range of Median	Recommended Ecological Management Class[13]
Low/marginal Floodplains that are not ecologically important and sensitive at any scale. The biodiversity of these floodplains is ubiquitous and not sensitive to flow and habitat modifications. They play an insignificant role in moderating the quantity and quality of water of major rivers.	>0 and ≤1	D

Table 9-36: Ecological Importance and Sensitivity Results

Wetland HGM Unit	EIS Score
Un-channelled Valley Bottom	D
Seepage Wetland	C
Limpopo River Riparian Habitat	C

9.7 Surface Water

The Surface Water Impact Assessment is attached as Appendix I.

The proposed Kubu Coal Mine falls within the Limpopo WMA1 and within quaternary catchment A41E. The Project area forms part of the western boundary of the A41E quaternary catchment, with the Limpopo River bordering the property to the north, as indicated in Plan 15, Appendix A. The Limpopo River is the only perennial river associated with quaternary catchment A41E. There are several unnamed non-perennial tributaries of the Limpopo River that drain the Project area, including the meandering arm that is gradually developing into an oxbow lake. PBA International (SA) undertook a surface water assessment for the region in 2009 in which floodlines were determined. The 1:100 year floodlines have been used and are illustrated in Plan 15, Appendix A.

The surface water attributes of the affected catchment, namely the Mean Annual Runoff (MAR), Mean Annual Precipitation (MAP) and Mean Annual Evaporation (MAE) were obtained from the WRC, 2005, and are summarised in Table 9-37. The MAP is 438 mm, with the MAE being 1 950 mm, resulting in a negative climatic water balance for the Project area.

Table 9-37: Summary of the Surface Water Attributes Associated with Quaternary Catchment A41E

Quaternary Catchment	Area (km^2)	MAP (mm)	MAR (mm)	MAR $m^3 * 10^6$	MAE (mm)
A41E	816	438	2.73	5.29	1 950

Source: WRC, 2005

9.7.1 Surface Water Uses

The predominant water users within the A41E quaternary catchment include agriculture, including irrigation and livestock watering, and mining, according to the DWS water use register database (WARMS) as of 16 July 2015. From the database, mining within this quaternary catchment is registered to extract from groundwater, while most of the irrigation uses are registered to abstract from the Limpopo River.

Due to the importance of the Limpopo River as a shared watercourse between South Africa, Botswana, Zimbabwe and Mozambique, the allocation of water for any use has to be signed off by the SADC river basin commission. Furthermore, the reduced flow as a result of the increased abstractions in the agricultural sector, the high evaporation rate and the looming climate change impacts, the Limpopo River is not a readily available source of water for any developments in South Africa including critical sectors such as power generation (Digby Wells, Surface Water Specialist Report, 2013).

9.7.2 Surface Water Quality

Digby Wells conducted a surface water quality assessment for the Boikarabelo Project, on behalf of Resource Generation, in 2009. Digby Wells also conduct quarterly monitoring for Ledjadja Coal's adjacent Boikarabelo Coal Mine. This quarterly water monitoring programme includes 13 surface water monitoring points and 40 boreholes. Three of the surface water monitoring locations (WSP8, W1SP1 and W1SP2) were selected as they were deemed relevant to the Kubu Coal Mine project due to their locality. In addition, Digby Wells collected samples on 6 May 2015 from the Limpopo River and the unnamed stream to assess the water quality within the proximity of the proposed Kubu Coal Mine. Most of the non-perennial streams in the area were found to be dry during the 2015 site visit and sampling of all of the monitoring locations was not possible.

Monitoring locations WSP8 and W1SP2 (2009 survey) coincide with monitoring locations SW65 and SW67 (2015 survey); Digby Wells' endeavoured to utilise the same locations used for the historical monitoring sites although due to the lack of water availability, the sampling was undertaken as close to the 2009 locations as possible. Samples were submitted to a SANAS accredited laboratory for analyses of physical and chemical water quality parameters. Water quality results for this sampling period are attached in Appendix I and the surface water monitoring and sampling locations are illustrated in Plan 15, Appendix A, with the coordinates provided in Table 9-38.

According to the DWS WARMS, the predominant water use around the Project area was agriculture (irrigation and livestock), and, as a result, the water quality was benchmarked against the South African Water Quality Guidelines (SAWQG) for Agricultural Use: Irrigation (DWAF, 1996) as presented in Table 9-39. Water quality results have also been benchmarked against the South African National Standards (SANS) 241: 2011 drinking water standards (Table 9-40). SANS 241 specifies the quality of acceptable drinking water, defined in terms of microbiological, physical, aesthetic and chemical determinants.

Table 9-38: Water Sampling Locations

Monitoring Location ID	Latitude	Longitude
ZPSW1	23° 31' 56" S	27° 11' 34" E
ZPSW2	23° 32' 23" S	27° 11' 23" E
ZPSW3	23° 32' 06" S	27° 10' 56" E
ZPSW4	23° 32' 09" S	27° 12' 16" E
ZPSW5	23° 31' 46" S	27° 12' 38" E
SW64	23° 31' 54" S	27° 11' 36" E
SW65	23° 32' 07" S	27° 11' 51" E
SW63	23° 32' 15" S	27° 10' 53" E
SW67	23° 32' 29" S	27° 11' 14" E
W1SP1	23° 32' 38" S	27° 11' 06" E
W1SP2	23° 32' 25" S	27° 11' 23" E
WSP8	23° 31' 57" S	27° 12' 07" E

Table 9-39 Water Quality Results benchmarked against the South African Water Quality Guidelines for Agricultural Use: Irrigation (DWAF, 1996)

Sample ID		pH-Value at 25° C	Conductivity at 25° C in mS/m	Total Dissolved Solids	Calcium as Ca	Magnesium as Mg	Sodium as Na	Potassium as K	Chlorides as Cl	Sulphate as SO_4	Nitrate NO_3 as N	Fluoride as F	Aluminium as Al	Iron as Fe	Manganese as Mn	Free and Saline Ammonia as N
South Africa Water Quality Guidelines: Agriculture Irrigation	Ideal	<6.5 - >8.4	N/A	90	N/A	N/A	115	N/A	N/A	N/A	N/A	2	5	5	0.02	N/A
	(Max. Allowable)	<6.5 - >8.4	N/A	>540	N/A	N/A	>460	N/A	N/A	N/A	N/A	>15.0	>20	>20	>10.0	N/A
	Date															
ZPSW1	01/09/2009	7.7	93	552	34	37	96	0	0	1	0	0.5	0.1	0.0	0.0	0.38
ZPSW2	01/09/2009	7.2	106	644	41	38	112	0	1	1	0	0.7	0.0	0.2	0.5	0.59
ZPSW3	01/09/2009	7.3	125	764	52	45	130	0	0	1	0	1.3	0.0	0.1	0.0	0.20
ZPSW4	01/09/2009	7.3	129	800	47	45	140	2	0	1	2	1.2	0.0	0.5	0.7	0.20
ZPSW5	01/09/2009	7.3	100	602	54	161	95	1	0	1	1	0.5	0.0	0.0	0.0	0.20
W1SP1	25/07/2014	8.4	82	449	48	33	71	2	0	0	2	0.4	0.1	0.0	0.0	0.1
W1SP2	25/07/2014	8.4	82	445	46	32	69	2	0	0	2	0.4	0.1	0.0	0.0	0.1
WSP8	25/07/2014	8	82	468	48	36	74	1	0	0	1	0.4		0.0	0.0	0.1
W1SP1	26/09/2014	8.2	179	1003	99	76	168	0	1	0	0	0.4	0.1	0.0	0.0	0.7
W1SP2	26/09/2014	8.2	179	989	98	76	171	0	0	0	0	0.3	0.1	0.0	0.0	0.1
WSP8	26/09/2014	8.0	156	857	79	61	144	0	0	0	0	0.3	0.0	0.0	0.0	0.1
W1SP1	12/12/2014	7.8	425	2215	244	155	344	0	0	1	0	0.7	0.1	0.0	0.0	0.1
W1SP2	12/12/2014	8	426	2196	254	162	354	0	0	0	**0**	0.5		0.0	0.0	0.2
WSP8	12/12/2014	7.7	426	2276	271	161	358	0	0	1	0	0.5	0.0	0.0	0.0	0.3
W1SP1	08/07/2015	7.9	268	1490	108	124	280	0	0	0	0	0.5	0.0	0.0	0.0	0.2
W1SP2	08/07/2015	8.2	270	1505.0	115	126	281	1	0	0	1	0.5	0.0	0.0	0.0	0.4
WSP8	08/07/2015	7.9	268	1509.0	111	128	286	0	0	0	0	0.4	0.1	0.0	0.0	0.4
SW64	06/05/2015	7.3	31	30.8	14	13	18	1	6	1	1	0.6	0.0	0.0	0.5	6.0
SW65	06/05/2015	8.4	4	182.0	84	73	161	0	0	0	0	-0.2	0.1	0.0	0.0	0.1
SW63	06/05/2015	8.3	2	36.3	30	19	20	1	0	1	1	0.8	0.0	0.0	0.0	0.1
SW67	06/05/2015	8.2	3	97.1	28	37	101	1	0	0	1	-0.2	0.1	0.0	0.0	0.1
W1SP2	17/09/2015	8.1	434	2387.0	148	193	443	0	0	1	0	0.5	0.0	0.0	0.0	0.1
WSP8	17/09/2015	8.4	133	747.0	37	59	157	0	0	1	0	0.5	0.0	0.0	0.0	0.1

Constituents highlighted in orange indicated exceedances of the Ideal limits

Constituents highlighted in red indicated exceedances of the Maximum Allowable limits

Table 9-40: Water Quality Results benchmarked against the SANS 241:2011 Drinking Water Quality Standards

Sample ID		pH-Value at 25° C	Conductivity at 25° C in mS/m	Total Dissolved Solids	Alkalinity	Chlorides as Cl	Sulphate as SO_4	Nitrate NO_3 as N	Free and Saline Ammonia as N	Fluoride as F	Calcium as Ca	Magnesium as Mg	Sodium as Na	Potassium as K	Aluminium as Al	Iron as Fe	Manganese as Mn
	Class I (Recommended)	5-9.5	150	1 000	No Limit	200	400	10	1	1	150	70	200	50	0.3	0.2	0.1
	Class II (Max. Allowable)	4-5 or 9.5-10	370	2 400	No Limit	600	600	20	2	1.5	300	100	400	100	0.5	2	1
	Duration	No Limit	70 years	70 years	No Limit	70 years	70 years	70 years	None	1 year	70 years	70 years	70 years	70 years	1 year	70 years	70 years
	Dates																
ZPSW1	01/09/2009	7.73	93	552	150	163	76.4	0.33	0.38	0.52	34	37.1	96.1	9.53	0.01	0.01	0.03
ZPSW2	01/09/2009	7.19	106	644	171	215	76.7	0.14	0.59	0.73	40.5	37.9	112	11	0.23	0.49	0.15
ZPSW3	01/09/2009	7.33	125.4	764	219	235	100	0.3	0.2	1.34	52.3	44.6	130	18.7	0.07	0.04	0.02
ZPSW4	01/09/2009	7.34	129.4	800	198	258	96.6	1.9	0.2	1.15	47.4	44.7	140	18.8	0.5	0.72	0.21
ZPSW5	01/09/2009	7.34	100.1	602	259	158	35.9	0.6	0.2	0.53	53.8	161	95.1	9.72	0.01	0.01	0.32
W1SP1	25/07/2014	8.37	81.9	449	176	93.8	82.6	1.56	0.08	0.36	47.5	32.8	70.7	7.42	0	0	0
W1SP2	25/07/2014	8.38	82.2	445	174	94.4	83.5	1.51	0.06	0.36	45.7	32	68.9	7.1	0	0	0
WSP8	25/07/2014	8.41	81.8	468	129	133	82.8	1.49	0.05	0.36	48	36	74.3	7.89	0	0	0
W1SP1	26/09/2014	8.24	179	1 003	153	441	112	0.35	0.68	0.37	99	76.3	168	10.6	0	0	0
W1SP2	26/09/2014	8.19	179	989	148	431	109	0.26	0.06	0.34	98.3	76.3	171	10.8	0	0	0
WSP8	26/09/2014	8	156	857	150	363	106	0.28	0.11	0.32	78.9	61.2	144	10.4	0	0	0
W1SP1	12/12/2014	7.83	425	2 215	150	1 242	123	0.22	0.05	0.72	244	155	344	14.5	0	0	0.49
W1SP2	12/12/2014	7.76	426	2 196	150	1 193	125	0.21	0.24	0.45	254	162	354	15.1	0	0	0
WSP8	12/12/2014	7.66	426	2 276	149	1 247	130	0.25	0.28	0.53	271	161	358	15.1	0	0	0
W1SP1	08/07/2015	7.94	268	1 490	141	754	118	0.48	0.24	0.46	108	124	280	16.9	0	0	0
W1SP2	08/07/2015	8.23	270	1 505	152	752	119	0.52	0.35	0.46	115	126	281	17.2	0	0	0
WSP8	08/07/2015	7.88	268	1 509	141	760	117	0.49	0.4	0.44	111	128	286	17.6	0	0	0
SW64	06/05/2015	7.32	31.2	30.8	176	6.88	4.72	1.47	5.99	0.56	14.2	13.1	17.9	9.74	0	0.52	0.69
SW65	06/05/2015	8.43	3.53	182	15	466	97.2	0.33	0.06	-0.21	84.2	73.1	161	11.9	0	0	0
SW63	06/05/2015	8.31	2.27	36.3	5	6.65	7.8	1.04	0.07	0.82	29.6	18.6	19.6	9.44	0	0	0
SW67	06/05/2015	8.15	2.82	97.1	12	209	61.4	1.25	0.12	-0.21	28.3	36.6	101	11.9	0	0	0
W1SP2	17/09/2015	8.08	434	2 387	127	1 237	264	0.22	0.05	0.54	148	193	443	22.6	0	0	0
WSP8	17/09/2015	8.42	133	747	134	317	84.3	0.22	0.09	0.5	36.8	59.3	157	9.89	0	0	0

Constituents highlighted in orange indicated exceedances of the SANS Class I limits

Constituents highlighted in red indicated exceedances of the SANS Class II limits

When compared to the SAWQG: Irrigation (DWAF, 1996), the surface water quality results can be summarised as follows:

- The observed parameters of concern were pH, Total Dissolved Solids (TDS) and sodium. Concentration for these parameters exceeded the SAWQG for irrigation. Elevated concentrations of manganese were also present which only exceeded the Ideal irrigation limit, but were still within the maximum allowable irrigation limits; and
- During the 2015 sampling period, pH and TDS were still persistent and exceeded maximum allowable irrigation limits.

The water quality results benchmarked against the SANS 241:2011 Drinking Water Quality Standards can be summarised as follows:

- During 2009, water quality results indicate that most parameters do not exceed the SANS 241: 2011 drinking water quality limits. This is with the exception of magnesium (161 mg per litre) at monitoring location ZPSW5 which exceeds the Class II maximum allowable standards of 100 mg per litre. Chloride at monitoring locations ZPSW2, ZPSW3 and ZPSW4 has shown elevated concentrations (215 mg per litre, 235 mg per litre and 258 mg per litre respectively) which exceeds the Class I or acceptable standards. These concentrations are still within the maximum allowable standard of 600 mg/l and are considered to be natural concentrations;
- Elevated concentrations of fluoride at monitoring locations ZPSW3 and ZPSW4 were observed. Iron and manganese at monitoring locations ZPSW2 and ZPSW4 have also shown elevated concentrations which only exceed Class I standards, but are still within Class II maximum allowable standards;
- During the 4th quarter of 2014, three of the surface water monitoring locations (WSP8, W1SP1 and W1SP2) exceeded Class II for Electrical Conductivity (EC), chloride and magnesium. This is typical of water impacted by high salt loads. The three monitoring locations are located on the farms Koert Louw Zyn Pan and Nazarov. The two sites are characterised by high chloride values and it has been concluded that these are natural concentrations (Digby Wells Annual Monitoring Report, 2014);
- During the 2nd quarter of 2015, an improvement was observed in the EC concentrations as it was within the SANS maximum allowable limit. However, monitoring locations W1SP1 and W1SP2 still exceeded the limits for chlorine and calcium; and
- During the May 2015 sampling period, only ammonia concentration (5.99 mg/l) was exceeding the SANS maximum allowable limits of 2 mg per litre whilst other analysed parameters were within the acceptable range.

9.8 Groundwater

The Groundwater Impact Assessment is included in Appendix J.

9.8.1 Geology

The coal deposits of South Africa are hosted in sedimentary rocks of the Karoo Supergroup. The coal resources of the Waterberg Coalfield occur in the Volksrust and Vryheid Formations of the Karoo Supergroup. The Waterberg Coalfield consists of 11 coal zones, with coal zone 1 located at the base. The Vryheid Formation consists predominantly of dull coal with minor carbonaceous mudstone and sandstone intercalations. The coal of the Vryheid Formation is located in coal zone 1 to zone 4. The Volksrust Formation consists of intercalated bright coal and mudstone and contains majority of the coal reserve in the coalfield, located within coal zone 5 to coal zone 11.

9.8.2 Groundwater Quality

A hydrocensus was undertaken in March 2015 to gather data on groundwater use on the Project area and its surroundings, namely farms Draai Om 244 LQ, Nazarov 685 LQ and Doornkopje 235 LQ. A total of 13 boreholes were identified during the desktop study, as depicted in Plan 16, Appendix A. The use of the identified boreholes included domestic purposes, stock watering and gardening. Of the 13 identified boreholes, 10 boreholes were accessed, 2 boreholes were dry and the remaining borehole was closed. The water levels of the accessed boreholes ranged between 6.6 mbgl (borehole KSGW1) and 26.7 mbgl (borehole DO05), as summarised in Table 9-41.

In addition, groundwater monitoring is undertaken for the Boikarabelo Coal Mine on the adjacent farms, including Witkopje, located to the west of Koert Louw Zyn Pan. The groundwater levels ranged from 6.6 mbgl to 39.9 mbgl, with the boreholes closes to the Limpopo River being very shallow and the depth increasing with distance from the River. The boreholes located are provided in Plan 16, Appendix A, and Table 9-42.

Table 9-41: Hydrocensus Summary

Site ID	Farm Names	Coordinates		Water level (mbgl)	Water level (mamsl)	Comments
		Latitude	Longitude			
D05	Draai Om	23°35' 06.4"S	27°11' 50.3"E	26.7	821.3	Water level sampled
D06	Draai Om	23°34' 53.1"S	27°12' 38.3"E	20.49	822.51	Water level sampled
KSGW1	Koert Zyn Pan	23°32' 22.2"S	27°11' 26.5"E	6.6	807.4	Water level sampled
KZGW2	Koert Zyn Pan	23°31' 45.8"S	27° 8' 32.2"E	9.37	825.63	Water level sampled
KZGW3	Koert Zyn Pan	23°32' 45"S	27° 9' 22"E	27.36	804.64	Water level sampled
KZGW4	Koert Zyn Pan	23°33' 52.3"S	27° 9' 21.9"E	20.54	814.46	Water level sampled
KZGW7	Koert Zyn Pan	23°34' 22"S	27°10' 32.2"E	-	-	No Access and sampled from outlet
KSGW9	Koert Zyn Pan	23°32' 37.6"S	27°12' 40.7"E	-	-	No Access and Sampled from outlet
KZGW15	Koert Zyn Pan	23°34' 16.1"S	27°11' 53.8"E	-	-	Dry
KZPHse1	Koert Zyn Pan	23°31' 48.6"S	27°12' 51.6"E	10.2	813.8	Water level sampled
SKP13	Koert Zyn Pan	23°34' 42.8"S	27°10' 40.8"E			Dry
SKP32a	Koert Zyn Pan	23°33' 48.9"S	27°12' 29.3"E	-	-	Water quality sampled

Table 9-42: Groundwater Levels on Surrounding Farms

Site ID	Coordinates			Water levels (mbgl)							
	Latitude	Longitude	Height (mamsl)	January 2015	February 2015	March 2015	April 2015	June 2015	July 2015	Aug 2015	Sept 2015
DO05	23°35'50.30" S	27°11'50.29" E	845.00	-	-	26.44	-	29.91	-	-	20.96
DO06	23°34'38.33" S	27°12'38.33" E	844.00	-	-	29.31	-	25.99	-	-	20.45
WO3	23°35'27.73" S	27°08'47.64" E	831.83	15.43	15.44	21.16	21.19	21.23	29.24	15.6	15.66
WO4	23°35'07.55" S	27°09'40.95" E	839.84	22.8	28.47	28.48	28.46	28.53	28.53	22.94	23
WitBH01	23°34'56.74" S	27°09'35.16" E	841.29	23.66	29.33	29.31	29.39	29.53	29.55	23.96	24.05
WitBH02	23°34'51.03" S	27°09.28.61'" E	837.10	19.39	28.49	25.05	25.14	28.72	25.32	19.74	19.82
WitBH03	23°34'44.95" S	27°09'21.70" E	831.69	14.17	19.85	19.85	19.91	20.03	20.06	4.47	14.55
WitBH04	23°34'34.63" S	27°09'10.06" E	824.51	7.11	24.89	12.98	13.07	16.89	13.37	7.79	7.84
WKBH01	23°35'20.98" S	27°09'58.51" E	839.76	22.43	28.12	28.12	28.14	28.17	28.17	21.81	22.58
WKBH02	23°35'11.87" S	27°08'52.39" E	830.40	13.13	13.13	18.87	18.91	19.02	19.05	13.54	13.47
WKBH03	23°34'48.59" S	27°07'21.87" E	829.40	39.9	39.86	16.64	17.46	17.54	39.86	26.8	26.78

Groundwater quality monitoring undertaken by Boikarabelo Coal Mine shows that the Project area has elevated concentrations of sulphates, chlorine, calcium and sodium. The elevated concentrations are naturally occurring ions in the groundwater and are associated with the Karoo aquifers and their mineralogy, as well as slow groundwater recharge. The current surface water sites around the proposed Kubu Coal Mine area are characterised by high chloride concentrations and it has been concluded from the quarterly water monitoring at the adjacent Boikarabelo Coal Mine that this is natural concentrations and do not relate to mining impacts in the region. (Digby Wells, 2015: Boikarabelo monitoring).

Boreholes DO05 and DO06 are included in the Boikarabelo Coal Mine water monitoring programme and the chemistry results were benchmarked against the SANS 241:2011 Drinking Water Standards. Based on the monitoring data, borehole DO06 has elevated concentrations of EC, TDS, chloride, sulphates, calcium and magnesium.

All measured element concentrations from borehole DO05 fall in the Class I water quality range of the SANS 204:2011 Drinking Water Standards, which indicates good water quality. During the 2015 hydrocensus, two water samples were collected and sent for analysis to a SANAS accredited laboratory, with the water quality benchmarked against the SANS 241:2011 Drinking Water Standards. The water quality samples are provided in Table 9-43, with the Piper Diagram illustrated in Figure 9-11. A Piper diagram is utilised to characterise water types in a graphical manner and to distinguish any specific water types or hydrochemical facies in an area. The Piper diagram was quartered to simplify this process and can be grouped into a left, bottom, right and upper quarter. The position of the water sample on the plot is based on the ratio of the various constituents, measured in equivalence and is not an indication of the absolute water quality or the suitability thereof for domestic consumption.

The calcium-magnesium-bicarbonate type water (left quarter of the Piper diagram) is normally characterised as freshly recharged water. Sodium-bicarbonate dominant water (bottom quarter) is typical of dynamic groundwater flow within an aquifer, with the sodium replacing calcium and magnesium in solution. The sodium-chloride dominant water (right quarter) is associated with stagnant or slow moving groundwater with little or no recharge and sulphate dominant water (top quarter) is typical of water impacted by the oxidation of pyrites which is commonly associated with mining impacts. The groundwater samples characteristics were considered natural and associated with the geological formations of the Karoo aquifer and are summarised as follows (Figure 9-11 and Table 9-43):

- Monitoring location SKP32 is characterised as the following:
  - Falls in the bottom quarter of the piper diagram, indicating water that is sodium-bicarbonate dominant; and
  - Has elevated concentrations of chlorine (207 mg per litre) and fluoride (1.32 mg per litre) which exceeds the recommended SANS241:2011 Drinking Water Standards but is within the maximum allowable limits.

- Monitoring location KZPHse1 is characterised as follows:
  - By calcium-sulphate water, falling in the top quarter of the piper diagram dominated by sulphates. This water is typical of impacted water by activities associated with mining; however monitoring location KZPHse1 is located approximately 500 m from the Limpopo River on the northeast of the proposed Project site where there are no mining activities; and
  - Concentrations of chlorine (751 mg per litre) and calcium (415 mg per litre) that exceed the SANS 241:2011 Class II, or maximum water quality guidelines. The borehole water also had elevated concentrations of TDS (1,815 mg per litre), magnesium (73.2 mg per litre) and EC (310 mS/m) which exceeded the recommended SANS 241:2011 limits but were within the maximum allowable limits.

Table 9-43: Groundwater Quality Samples Benchmarked Against the SANS 241:2011 Drinking Water Standards

Date	Sample ID		Total Dissolved Solids	Nitrate NO_3 as N	Chlorides as Cl	Total Alkalinity as $CaCO_3$	Sulphate as SO_4	Calcium as Ca	Magnesium as Mg	Sodium as Na	Potassium as K	Iron as Fe	Manganese as Mn	Conductivity at 25° C in mS/m	pH-Value at 25° C	Aluminium as Al	Free and Saline Ammonia as N	Fluoride as F
	Class I	(Recommended)	<1000	<10	<200	N/S	<400	<150	<70	<200	<50	<0.2	<0.1	<150	5-9.5	<0.3	<1	<1
	Class II	(Max. Allowable)	1000-2400	10-20	200-600	N/S	400-600	150-300	70-100	200-400	50-100	0.2-2	0.1-1	150-370	4-5 or 9.5-10	0.3-0.5	1-2	1-1.5
		Duration	70 years	70 years	70 years	N/S	70 years	70 years	70 years	70 years	70 years	70 years	70 years	70 years	No Limit	1 year	None	1 year
2015/03/09	SKP32a		860	3.2	207	444	45	89	39	182	13	0.0	0.0	139	7.49	0.0	0.1	1.32
2015/03/09	KZPHse1		1 815	1.3	751	214	267	415	73	154	18	0.0	0.0	310	7.98	0.0	0.1	0.22

Constituents highlighted in orange indicated exceedances of the SANS Class I limits

Constituents highlighted in red indicated exceedances of the SANS Class II limits

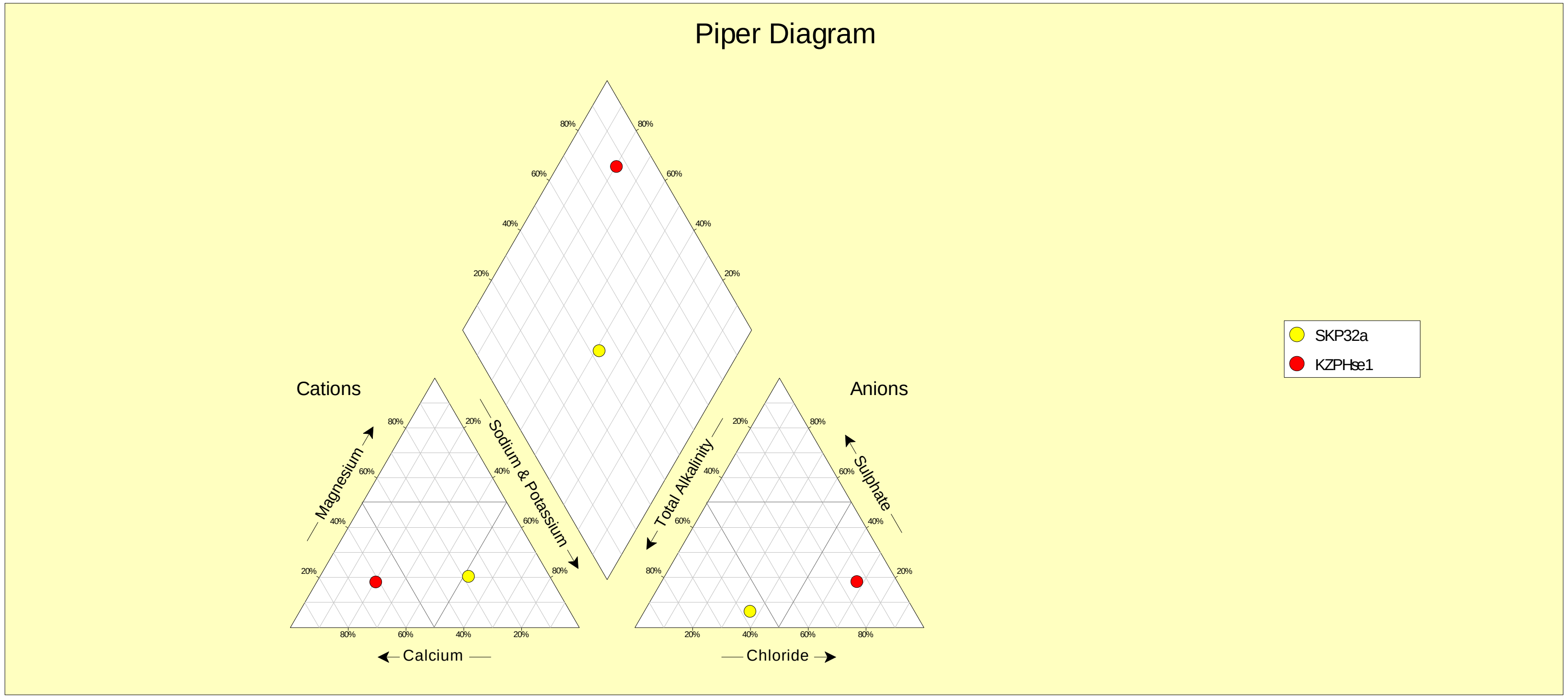


Figure 9-11: Piper Diagram for the Sampled Boreholes

9.8.2.1 Groundwater Recharge

Highly variable recharge occurs over the area, but values are generally between 1% and 3% of the MAP for undisturbed areas, as reported in the Groundwater Resource Directed Measures (GRDM) database (DWAF, 2006).

Some of the historical recharge estimates include:

- Vegter (1995) estimates the regional recharge in the range of 0.2% to 1.2% of MAP;
- Steenekamp (2001) between 0.1% to 0.4% of MAP;
- Golder Associates (2007) approximately 1% of MAP;
- WGC (2008) in the range of 2% to 6% of MAP;
- Bester and Vermeulen (2009) (using the chloride method) estimated the recharge to be 1.5%, but their final model was calibrated in the order of 0.005%; and
- ERM (2010) approximately 0.5% of the MAP.

9.9 Noise

The baseline noise soundscape of the Project area has been characterised by means of baseline noise measurements. The measurements were undertaken in accordance with the National Noise Control Regulations in terms of the ECA and the SANS 10103:2008 Measurement and Rating of Environmental Noise. The baseline monitoring was undertaken at identified receptors as listed in Table 9-44 and illustrated in Plan 17, Appendix A. The results from the noise meter recordings for the sampled locations, as well as the SANS 10103:2008 ratings levels, are presented in Table 9-45. The identified noise receptors consisted of residential households.

Table 9-44: Identified Noise Receptors

Site ID	Farm
RGN1	Nazarov 685 LQ
RGN2	Doornkopje 235 LG
RGN3	Doornkopje 235 LG
RGN4	Swelpan 269 LQ

Table 9-45: Results of the Baseline Noise Measurements

Sample ID	SANS 10103:2008 Rating Limit					
	Type of District	Period	Acceptable Rating Level (dBA)	$L_{Areq,T}$ (dBA)	Maximum/Minimum (dBA)	Date
RGN1	Rural	Daytime	45	44	67 / 30	20/01/2009
		Night time	35	39	48 / 31	21/01/2009
RGN2	Rural	Daytime	45	43	66 / 30	20/01/2009
		Night time	35	37	56 / 30	20/01/2009
RGN3	Rural	Daytime	45	47	69 / 32	20/01/2009
		Night time	35	43	53 / 35	20/01/2009
RGN4	Rural	Daytime	45	45	72 / 30	20/01/2009
		Night time	35	51	51 / 38	20/01/2009
	Indicates current $L_{Aeq,T}$ levels above either the daytime rating limit or the night time rating limit					

Based on the results from the baseline environmental noise measurements it is noted that the day time ambient noise levels in and around the Project site are between 42 decibels (dB) and 48 dB, with the maximum allowable outdoor limit for ambient noise in a rural district being 45 dB. The reason of the levels being above the acceptable range limit may be attributed to noises associated with drilling operations within the Project area at the time of the measurement and noise generated by farming machinery at RGN3.

The night time ambient noise levels were recorded between 37 dB and 43 dB, which is slightly above the night time noise limit for rural districts of 35 dB. The causes for the exceedance of the acceptable range limit may be attributed to the noise generated by a radio playing at the farm labourer's quarters at receptor point RGN1, as well as the high pitch sound made by the *Gryllidae* (Crickets), which is a common noise occurrence during the night time.

9.10 Socio-Economic Baseline

A Social Impact Assessment was undertaken by Masimong Resource Solutions (Pty) Ltd (Masimong) for the Kubu Coal Mine Project; the baseline environment and findings from the adjacent Boikarabelo Coal Mine were used as part of the Social Impact Assessment. The Social Impact Assessment is provided in Appendix K.

9.10.1 Socio—Economic Overview

The proposed Kubu Coal Mine falls within the LLM and Waterberg District Municipality and is located adjacent to the proposed Boikarabelo Coal Mine to the south, Botswana across the Limpopo to the north and Lephalale town approximately 55 km to the southeast. According to the Census, 2011, and taking into account an annual population growth of 3.1%, the population of the LLM is estimated at a total of 126 870 residents. According to a skills database established by the adjacent Boikarabelo Coal Mine in 2013, majority of residents are literate, with a small percentage of residents having studied further to obtain tertiary qualifications. Skills and experience obtained by residents of the LLM are associated primarily with construction activities, due to the dominant electricity and mining industries within Lephalale.

LLM's contribution of mining to the District GDP is significant at 59%, with electricity contributing 11%, with agriculture and manufacturing having a contribution as well. Agriculture within the municipality employs the largest workforce, with 38.9% of the employed workforce, followed by community services which employ 15.71% of the workforce (LLM IDP, 2014-2016).

9.10.2 Affected Communities

Stakeholders of the Project were identified and categorised, with focus placed on the immediate surroundings of the proposed Kubu Coal Mine. The stakeholders have been identified and categorised as either local, provincial, national or international divisions, as summarised in Figure 9-12.

<table>
<tr><th>Local</th><th>Provincial</th><th>National</th><th>International</th></tr>
<tr><td>Communities</td><td></td><td></td><td></td></tr>
<tr><td colspan="4">Employees</td></tr>
<tr><td colspan="2">Suppliers</td><td colspan="2"></td></tr>
<tr><td colspan="2">Political players</td><td colspan="2"></td></tr>
<tr><td></td><td colspan="2">Regulatory bodies</td><td></td></tr>
<tr><td></td><td colspan="3">Competitors</td></tr>
<tr><td></td><td colspan="2">NGO’s</td><td></td></tr>
<tr><td></td><td colspan="3">Financial institutions</td></tr>
<tr><td colspan="2"></td><td colspan="2">Customers</td></tr>
</table>

Figure 9-12: Koert Louw Zyn Pan Stakeholders (RBS-SA, 2015)

The following communities and local stakeholders have been analysed in further detail:

- Local communities: WOC’s core and affected communities have been identified as follows, in order of priority, for the proposed Kubu Coal Mine Project:
  - Lesedi (including Vangpan), as well as directly affected and adjacent landowners;
  - Marapong;
  - Onverwacht, Lephalale and Mamojela;
  - Seleka;
  - Shongoane; and
  - Abbotspoort.
- Employees (recruited from local communities) and the skilled and scarce skilled potentially from outside of Lephalale;
- Suppliers, namely:
  - Black Economic Empowerment (BEE) suppliers;
  - Local small, medium and macro enterprises (SMMEs); and
  - Local business forums.

- Political players (local municipal structure).

The LLM includes the local mine communities, local employees within these communities and local suppliers. The population of the LLM is estimated at 126 870 people, with 54% of the population being male and the remaining 46% are female (RBS-SA, 2015). The populations of the affected communities is summarised in Table 9-46.

Table 9-46: Kubu Coal Mine Core and Affected Communities

Town/ Community/ Village	Population	Distance from Project (km's)
Lesedi (including Vangpan)	1 474	30 – 34
Marapong	28 635	72
Lephalale/ Onverwacht/ Mamojela	38 632	73 – 82
Seleka	32 116	110 – 140
Shongoane	16482	120 – 140
Abbotspoort	3 617	132 – 146

Source: RBS-SA, 2015

A skills audit was undertaken by Ledjadja Coal for the Boikarabelo Coal Mine in 2013 and the sampled population equated to 10% of the populations detailed in Table 9-46. Based on the skills audit, the socio-economic baseline has been summarised as follows:

- Mining within the LLM contributes 59.21% to the Waterberg GDP, followed by electricity which contributes 11.33% to the GDP;
- There is a limit in terms of the general capacity and availability of services and infrastructure, especially in terms of electricity, water, health care, security, roads, recreation facilities, housing, etc.;
- A significant portion of candidates (81%) of the entire community database are considered to be literate (above ABET level 4) and have Grade 10 or above. 36% of this population have Grade 12, while only 8% have no form of secondary education;
- Of the 32% of individuals who have obtained Grade 12, only 2% have studied further and have completed their tertiary education, of which 54% have qualifications relevant to the Mining Industry (only 9% have a Mining technical qualification including Engineering, Mining, Plant and Mine Technical Services);
- 54% of the community members have obtained skills certificates as a result of formal and informal training. 49% of these are mining related skills, with only 30% having technical mining skills; and

- 15% of individuals on the database have mining related experience, which consists of 6% mining technical experience and 8% that have non-technical experience (Human Resources, Finance, Security, Safety, Health and Environment, Information Technology and Administrative courses). The two largest industries covered by experience is Construction (22% of individuals), due to the nature of the businesses such as the power plants in the area, followed by cleaning and gardening (10%).

9.11 Cultural Heritage

An Archaeological Impact Assessment (AIA) was compiled for Koert Louw Zyn Pan in 2009 and submitted to the SAHRA on 19 March 2009, as provided in Appendix L, along with comment issued by SAHRA.

A summary of the baseline cultural environment has been provided below, with all heritage resources indicated in Plan 18, Appendix A. SAHRA has already issued comment for the required mitigation and management measures to be implemented at the Project site should an MRA be granted. These mitigation and management measures have been included as part of this EIA and EMP.

9.11.1 Geology and Palaeontological Sensitivity

The geology within which coal typically occurs is inherently plant fossil rich, but fossils in the coal itself are modified beyond recognition; associated shale and mudstone allow for better preservation of fossil plants. Rocks present in the Project area comprise coarse, yellowish, gravelly, cross bedded sandstones, with ferruginous laminae along the bedding planes. The potential fossils associated with the respective lithostratigraphy includes rare marine invertebrates (e.g. molluscs), fish, vascular plants (including petrified wood), *Glossopteris* flora palynomorphs, mesosaurid reptile, coprolites; crustaceans, sparse marine shelly invertebrate (brachiopods) and insect fossils, as well as microfossils among others.

The palaeontological potential of the Project area is displayed in Figure 9-13, based on the South African Heritage Resources Information Systems (SAHRIS) PalaeoMap, with the Project area situated in an area ranging from moderate to high fossil sensitivity.

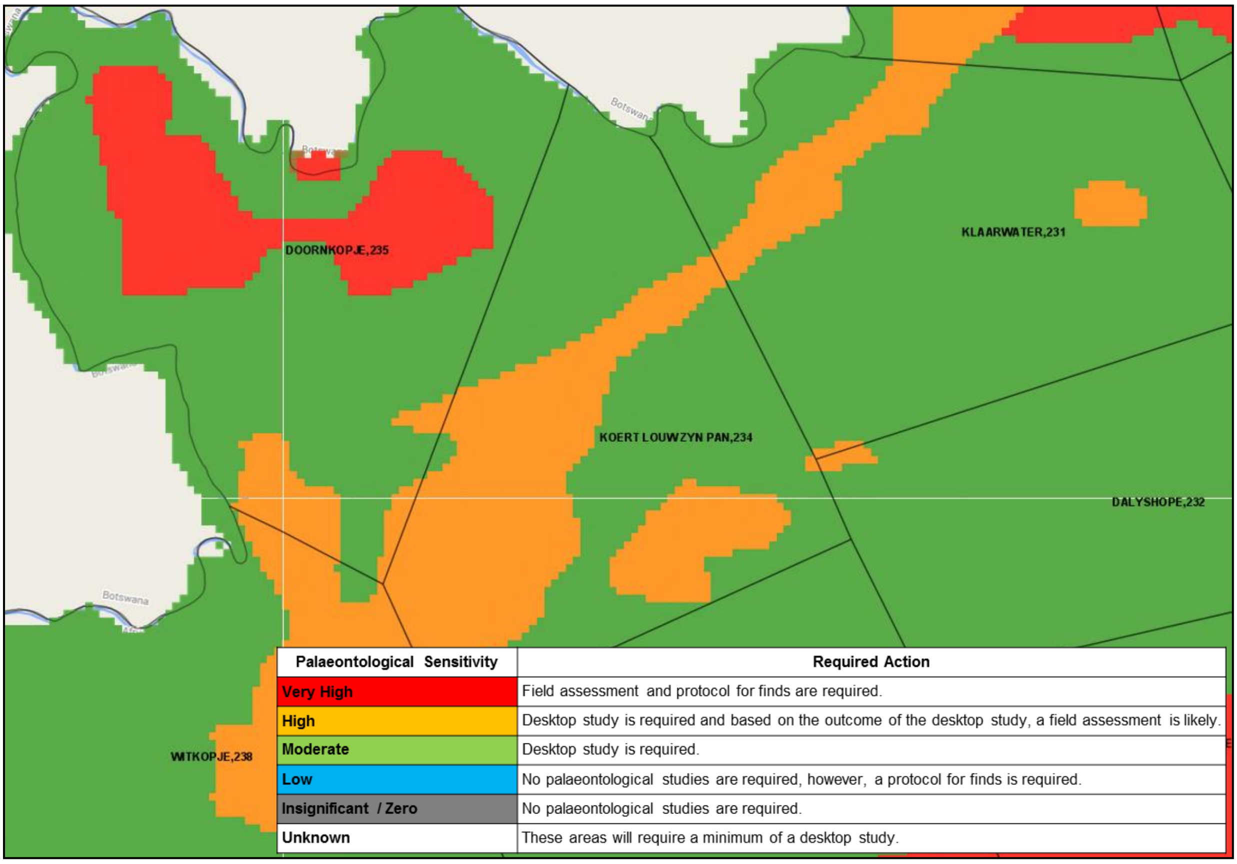


Figure 9-13: SAHRIS PalaeoMap Indicating Fossil Sensitivity for the Project Area and Region

9.11.2 Cultural Landscape

Archaeological Farming Community settlements have been identified both in South Africa and Botswana. Existing archaeological surveys and excavations have indicated extensive Farming Community settlement associated with Letsibogo and Toutswe ceramic facies from the Moloko and Nkope Branch respectively.

There is a likelihood that similar sites may be found in the South African floodplain, as initially indicated through the survey results of the 2009 Koert Louw Zyn Pan AIA which identified 42 archaeological sites ranging from a few scattered surface ceramics to more stratified and possibly complex sites. In addition, 142 archaeological sites including Stone Age and Farming Community sites were identified by Digby Wells during a Heritage Impact Assessment (HIA) undertaken on farms to the east of the Project area[14].

Extensive Phase 2 archaeological assessments by Digby Wells of 17 sites out of 25 identified sites on the farms Zeekoeivley 241 LQ and Kalkpan 243 LQ (properties included in the Boikarabelo Coal Mine) confirmed the presence of Late Farming Community

[14] Refer to SAHRIS Case 2123

settlements, carbon dated to after the late 17th century to the early 18th century, i.e. 1680s to early 1700s[15]. These sites are, however, not as extensive as those present in the Botswanan floodplain west of the Limpopo River.

Preliminary evaluation of the fragmented finds of the 2009 Koert Louw Zyn Pan AIA survey, as well as other studies undertaken by Digby Wells and others, has indicated similar affinities as well as possible ceramic facies related to the Moloko branch. These preliminary finds and extrapolation of the Botswana data indicates possible new research on ceramic typological sequences previously sparsely researched in South Africa.

A summary of the cultural heritage sites identified on site are listed in Table 9-47.

[15] Refer to SAHRIS Case IDs 601, 1074 and 6249, and File Reference 9/2/253/0003 (http://www.sahra.org.za/sahris/sahris).

Table 9-47: Sites of Archaeological and Heritage Significance

Site Name	Description	Field Rating	Mitigation	Photograph
2327CA-PGS001	This site had red sandy soils with areas mixed with ash or animal dung (wild or domestic). Five non-diagnostic potsherds were recovered in and around several animal burrows from within the clearing. Two fragments of possible vitrified hut clay were found from another animal burrow underneath a Shepherds/Mutopi tree (Boscia foetida subsp. rehmanniana). No diagnostic/ decorated potsherds, structures or other features were identified.	GP.C	No further mitigation - Monitoring	
2327CA-PGS002	This site was identified in a clearing in the dense natural bush with extensive animal burrowing activities. The site had red sandy soils with areas mixed with ash or animal dung (wild or domestic). More than 30 non-diagnostic potsherds and three decorated potsherds (one graphite; one ochre and one impression) were recovered in and around several animal burrows from within the clearing. One possible rubbing/smearing stone was also found. On closer inspection of the animal burrows a layer of archaeological deposit was identified at a depth of approximately 10-15 cm. The layer was approximately 5-10 cm thick and consisted mostly of ash and dung deposits. No structures or other features were identified.	GP.A	Phase 2 Mapping and test excavations	
2327CA-PGS003	This site had red sandy soils with areas mixed with ash or animal dung (wild or domestic). Five non-diagnostic potsherds were recovered in and around several animal burrows from within the clearing. No diagnostic/decorated potsherds, structures or other features were identified.	GP.B	Phase 2 Shovel Test Pit (STP)	

Site Name	Description	Field Rating	Mitigation	Photograph
2327CA-PGS004	A small site in a small clearing in the dense natural bush was identified here. The site had red sandy soils with areas mixed with ash or animal dung (wild or domestic). Five non-diagnostic potsherds were recovered in and around several animal burrows from within the clearing. No diagnostic/decorated potsherds, structures or other features were identified.	GP.B	Phase 2 STP	
2327CA-PGS005	A site in a large clearing in the dense natural bush was identified here. The site had red sandy soils with areas mixed with ash or animal dung (wild or domestic). 10 x non-diagnostic potsherds and three fragments of possible rubbing/smearing stones were recovered in and around several animal burrows from within the clearing. No diagnostic/decorated potsherds, structures or other features were identified.	GP.B	Phase 2 STP	
2327CA-PGS006	Two non-diagnostic potsherds and a Middle Stone Age (MSA)-core were found in and around several animal burrows.	GP.C	No further mitigation - Monitoring	
2327CA-PGS007	Three non-diagnostic potsherds were found in and around several animal burrows.	GP.C	No further mitigation - Monitoring	

Site Name	Description	Field Rating	Mitigation	Photograph
2327CA-PGS008	This site was identified in a clearing in the dense natural bush, with extensive animal burrowing activities. The site had red sandy soils with areas mixed with ash or animal dung (wild or domestic). More than 30 non-diagnostic potsherds, four potsherds with decorations (one graphite; one impression; two graphite, ochre and impressions) and one potsherd with a bored hole through it, were recovered in and around several of the animal burrows as well as from the surface within the clearing. Fragments of vitrified hut rubble and vitrified dung were found. One possible rubbing/smearing stone was also found. On closer inspection of the animal burrows, a layer of archaeological deposit was identified at a depth of approximately 10-15 cm. This layer consisted mainly of ash and vitrified dung, but animal bone fragments were also identified. The layer varied in thickness and measured approximately between 10 cm and 15 cm. No structures or other features were identified.	GP.A	Phase 2 Mapping and test excavations	
2327CA-PGS009	Four potsherds were found in and around several animal burrows at this location. Two of these potsherds were decorated with graphite.	GP.C	No further mitigation - Monitoring	

Site Name	Description	Field Rating	Mitigation	Photograph
2327CA-PGS010	This site was identified in a clearing in the dense natural bush, with extensive animal burrowing activities. The site had red sandy soils with areas mixed with ash or animal dung (wild or domestic). More than 20 non-diagnostic potsherds, one rim-shard and a fragment of an upper grinding stone were recovered in and around several of the animal burrows as well as from the surface within the clearing. Fragments of vitrified hut rubble and vitrified dung were found. On closer inspection of the animal burrows, a layer of archaeological deposit was identified in one of the burrows at a depth of approximately 10-15 cm. This layer consisted mainly of ash and vitrified dung, but animal bone fragments were also identified. The layer varied in thickness and measured approximately between 5 cm and 10 cm. Another layer was identified in another animal burrow and this layer was also approximately 15 cm underneath the present surface. This layer consisted mainly of ash and vitrified dung which was approximately 5cm to 10 cm thick (on top of a clay floor which measured 2 cm to 4 cm thick). The floor was in a fair condition albeit damaged and exposed to animal movement. No structures or other features were identified.	GP.A	Phase 2 Extensive Documentation	
2327CA-PGS012	One decorated potsherd (impressions) and a MSA-tool were found in and around several animal burrows at this location.	GP.C	No further mitigation - Monitoring	
2327CA-PGS013	Four non-diagnostic potsherds and one decorated potsherd (graphite, ochre and impressions) were found in and around several animal burrows at this location.	GP.C	No further mitigation - Monitoring	

Site Name	Description	Field Rating	Mitigation	Photograph
2327CA-PGS014	A small site in a small clearing in the dense natural bush was identified here. The site had red sandy soils with areas mixed with ash or animal dung (wild or domestic). 20 non-diagnostic potsherds and four decorated potsherds (one graphite; one ochre; and two impressions) were uncovered in and around several animal burrows from within the clearing. No structures or other features were identified	GP.B	Phase 2 STP	
2327CA-PGS015	A site was identified in a clearing in the dense natural bush, with extensive animal burrowing activities. The site had red sandy soils with areas mixed with ash or animal dung (wild or domestic). More than 25 non-diagnostic potsherds, eight potsherds with decorations (two graphite; four ochre and two impressions) and one rim-shard, were recovered in and around several of the animal burrows as well as from the surface within the clearing. Six pieces of slag were also found in and around the animal burrows. An ash-concentration was identified in the middle of the clearing. No structures or other features were identified.	GP.A	Phase 2 Mapping and test excavations	
2327CA-PGS016	A single non-diagnostic potsherd was found in one of several animal burrows at this location	GP.C	No further mitigation - Monitoring	
2327CA-PGS017	One non-diagnostic potsherd, one decorated potsherd (graphite, ochre and impressions) and an animal bone fragment were found in and around several animal burrows at this location.	GP.C	No further mitigation - Monitoring	

Site Name	Description	Field Rating	Mitigation	Photograph
2327CA-PGS018	Some of the remains and rubble of the possible labour quarters for the farm labourers were identified at this location. A make-shift kraal was identified next to the remains. The structures were demolished and most of the rubble was removed. The age, size and shapes of the structures are unknown. This site was to be associated with Site 2327CA-PGS019 (location of the main farm house). The site is approximately 50 m by 50 m.	GP.C	No further mitigation - Monitoring	
2327CA-PGS019	Some of the remains and rubble of the main farm house of the farm. All of the structures were demolished and most of the rubble was removed. The age, size and shapes of the structures are unknown. Site size: Approximately 100 m by 100m.	GP.C	No further mitigation - Monitoring	
2327CA-PGS020	Find spot: two non-diagnostic potsherds were found in and around several of the animal burrows at this location. Site size: Approximately 30 m in diameter.	GP.C	No further mitigation - Monitoring	
2327CA-PGS021	Find spot: one non-diagnostic potsherd, one decorated potsherd (impressions) and a MSA-tool were found in and around several of the animal burrows at this location. Site size: Approximately 30 m in diameter.	GP.C	No further mitigation - Monitoring	

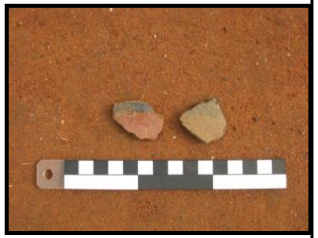
Site Name	Description	Field Rating	Mitigation	Photograph
2327CA-PGS022	A small site in a small clearing in the dense natural bush was identified here. The site had red sandy soils with areas mixed with ash or animal dung (wild or domestic). Five non-diagnostic potsherds and two MSA-cores were recovered in and around several animal burrows from within the clearing. No diagnostic/decorated potsherds, structures or other features were identified here. Site size: Approximately 60 m in diameter	GP.C	No further mitigation - Monitoring	
2327CA-PGS023	A small site in a small clearing in the dense natural bush was identified here. The site had red sandy soils with areas mixed with ash or animal dung (wild or domestic). Over 30 non-diagnostic potsherds, four decorated potsherds (two graphite, ochre and impressions; two impressions) were found in and around several animal burrows from within the clearing. No archaeological deposit could be identified in the animal burrows although many potsherds were recovered. No structures or other features were identified here. Site size: Approximately 50 m in diameter.	GP.B	Phase 2 STP	
2327CA-PGS024	A site was identified in a clearing in the dense natural bush, with extensive animal burrowing activities. The site had red sandy soils with areas mixed with ash or animal dung (wild or domestic). More than 30 non-diagnostic potsherds, six potsherds with decorations (two graphite; two ochre; one graphite, ochre and impressions; one impression) were recovered in and around several of the animal burrows as well as from the surface within the clearing. A possible ash-midden/ash-concentration was identified in the middle of the clearing. No structures, other finds or other features were identified here. Site size: Approximately 80 m in diameter.	GP.B	Phase 2 STP	

Site Name	Description	Field Rating	Mitigation	Photograph
2327CA-PGS025	A small site in a small clearing in the dense natural bush was identified here. The site had red sandy soils with areas mixed with ash or animal dung (wild or domestic). Over 15 non-diagnostic potsherds were found in and around several animal burrows from within the clearing. No archaeological deposit could be identified in the animal burrows although a fair amount of potsherds were recovered. No structures, other finds or other features were identified here. Site size: Approximately 40 m in diameter.	GP.B	Phase 2 STP	
2327CA-PGS026	A small site in a small clearing in the dense natural bush was identified here. The site had red sandy soils with areas mixed with ash or animal dung (wild or domestic). Over 10 non-diagnostic potsherds and one rim-shard were found in and around the few animal burrows from within the clearing. No archaeological deposit could be identified in the animal burrows. No structures, other finds or other features were identified here. Site size: Approximately 40 m in diameter.	GP.B	Phase 2 STP	
2327CA-PGS027	Find spot: two non-diagnostic potsherds were found in and around several of the animal burrows at this location. Site size: Approximately 20 m in diameter.	GP.C	No further mitigation - Monitoring	
2327CA-PGS028	Find spot: one non-diagnostic potsherd and one decorated potsherd (impressions) were recovered from the surface in a large open area at this location. Site size: Approximately 20 m in diameter.	GP.C	No further mitigation - Monitoring	

Site Name	Description	Field Rating	Mitigation	Photograph
2327CA-PGS029	A small site in a small clearing in the dense natural bush was identified here. The site had red sandy soils with areas mixed with ash or animal dung (wild or domestic). Seven non-diagnostic potsherds and one decorated potsherd (graphite, ochre and impressions) were found in and around the animal burrows from within the clearing. No archaeological deposit could be identified in the animal burrows. No structures, other finds or other features were identified here. Site size: Approx. 60 m by 60 m.	GP.B	Phase 2 STP	
2327CA-PGS030	A site in a large clearing in the dense natural bush was identified here. The site had red sandy soils with areas mixed with ash or animal dung (wild or domestic). Over a 100 non-diagnostic potsherds, nine decorated potsherds (one ochre; four impressions; three graphite and impressions; one graphite, ochre and impressions), two rim-sherds and a MSA-tool were recovered in and around several animal burrows as well as from the surrounding surface from within the clearing. The animal burrows on the southern end produced the most finds. These animal burrows were closely inspected, but no archaeological deposit could be identified in them. A possible ash-midden/kraal was identified near the middle of the site. No other structures, finds or features were identified here. An amount of damage was caused to the surface of the area and most probably also to the subterranean archaeological deposits due to bush-clearing with earth-moving machinery. Site size: Approximately 200 m in diameter.	GP.A	Phase 2 Extensive Documentation	
2327CA-PGS031	Find Spot: three non-diagnostic potsherds were found in and around several of the animal burrows at this location. Site size: Approximately 20 m in diameter.	GP.C	No further mitigation - Monitoring	

Site Name	Description	Field Rating	Mitigation	Photograph
2327CA-PGS032	Find spot: two non-diagnostic potsherds and a rim-shard were recovered from the surface at this location. Site size: Approximately 20 m in diameter.	GP.C	No further mitigation - Monitoring	
2327CA-PGS033	A large, extensive site was identified in a clearing in the dense natural bush, with the site extending into the encroaching bushes. Most of the finds were made in and around the extensive animal burrowing activities across the site, although surface finds were also made occasionally. The site had red sandy soils with areas mixed with ash or animal dung (wild or domestic). More than 60 non-diagnostic potsherds, five decorated potsherds (two impressions; two graphite and ochre; one graphite, ochre and impressions) and a fragment of a lower grinding stone were recovered in and around several of the animal burrows as well as from the surface within the clearing. Fragments of vitrified hut rubble and vitrified dung were found. On closer inspection of the animal burrows, a layer of archaeological deposit was identified in two of the burrows at a depth of approximately 15 to 20 cm. These layers consisted mainly of ash and vitrified dung, but animal bone fragments and potsherds were also identified. The layers varied in thickness and measured approximately between 10 cm and 15 cm. These layers of ash and dung occurred to the central parts of the identified site. No structures or other features were identified here. Site size: Approximately 300 m in diameter.	GP.A	Phase 2 Extensive Documentation	
2327CA-PGS034	One non-diagnostic potsherd and one rim-shard were found in and around several of the animal burrows at this location. Site size: Approximately 30 m in diameter.	GP.C	No further mitigation - Monitoring	

Site Name	Description	Field Rating	Mitigation	Photograph
2327CA-PGS035	A small site in a small clearing in the dense natural bush was identified here. The site had red sandy soils with areas mixed with ash or animal dung (wild or domestic). Six non-diagnostic potsherds were found in and around the animal burrows from within the clearing. No archaeological deposit could be identified in the animal burrows. No structures, other finds or other features were identified here. Site size: Approximately 30 m in diameter.	GP.B	Phase 2 STP	
2327CA-PGS036	A large, extensive site in a large clearing in the dense natural bush was identified here. The site had red sandy soils with areas mixed with ash or animal dung (wild or domestic). Over 30 non-diagnostic potsherds, seven decorated potsherds (three ochre; one impressions; one graphite and impression; two ochre and impressions) were recovered in and around several animal burrows as well as from the surrounding surface from within the clearing. The animal burrows were closely inspected, but no archaeological deposit could be identified in them. No other structures, finds or features were identified here. Site size: Approximately 200 m in diameter.	GP.A	Phase 2 Mapping and test excavations	
2327CA-PGS037	A large site in a large clearing in the dense natural bush was identified here. The site had red sandy soils with areas mixed with ash or animal dung (wild or domestic). 15 non-diagnostic potsherds and two rim-sherds were recovered in and around several animal burrows as well as from the surrounding surface from within the clearing. The animal burrows on the southern end produced the most finds. These animal burrows were closely inspected, but no archaeological deposit could be identified in them. No other structures, finds or features were identified here. Site size: Approximately 200 m in diameter.	GP.A	Phase 2 Mapping and test excavations	

Site Name	Description	Field Rating	Mitigation	Photograph
2327CA-PGS038	Find Spot: one non-diagnostic potsherd and one decorated potsherd (ochre, graphite and impressions) were found in and around several of the animal burrows at this location. Site size: Approximately 30 m in diameter.	GP.C	No further mitigation – Monitoring	
2327CA-PGS039	A large site in a large clearing in the dense natural bush was identified here. The site had red sandy soils with areas mixed with ash or animal dung (wild or domestic). Over 50 non-diagnostic potsherds, nine decorated potsherds (four impressions; three graphite; two ochre), two rim-sherds, one MSA-tool, one MSA-core and a piece of slag were recovered in and around several animal burrows as well as from the surrounding surface from within the clearing. The animal burrows were closely inspected and archaeological deposits were identified in them. These deposits were approximately 15 cm from the surface and the layers varied in thickness. They consisted mainly of ash, animal bone fragments and a few potsherds. No other structures, finds or features were identified here. Site size: Approx. 1 m by 1 m.	GP.A	Phase 2 Mapping and test excavations	
2327CA-PGS040	A large site in a large clearing in the dense natural bush was identified here. The site had red sandy soils with areas mixed with ash or animal dung (wild or domestic). Over 50 non-diagnostic potsherds, two decorated potsherds (one impression: one graphite), one rim-shard and a rubbing/smearing stone were recovered in and around several animal burrows as well as from the surrounding surface from within the clearing. The animal burrows were closely inspected, but no archaeological deposit could be identified in them. No other structures, finds or features were identified here. Site size: Approximately 300 m in diameter.	GP.A	Phase 2 Mapping and test excavations	

Site Name	Description	Field Rating	Mitigation	Photograph
2327CA-PGS041	Find spot: three non-diagnostic potsherds and one MSA-tool were found in and around several of the animal burrows at this location. Site size: Approximately 30 m in diameter.	GP.C	No further mitigation - Monitoring	
2327CA-PGS042	Find spot: two non-diagnostic potsherds and a rubbing/smearing stone were found in and around several of the animal burrows at this location. Site size: Approximately 30 m in diameter.	GP.C	No further mitigation - Monitoring	
2327CA-PGS043	Find spot: five non-diagnostic potsherds were found in and around several of the animal burrows at this location. Site size: Approximately 30 m in diameter.	GP.C	No further mitigation - Monitoring	
2327CA-PGS044	A large site in a large clearing in the dense natural bush was identified here. The site had red sandy soils with areas mixed with ash or animal dung (wild or domestic). Over 20 non-diagnostic potsherds, one rim-shard and two fragments of lower grinding stones were recovered in and around several animal burrows as well as from the surrounding surface from within the clearing. The animal burrows were closely inspected, but no archaeological deposit could be identified in them. Two circular structures were identified approximately 15 m from each other. They were located approximately 50 m from the	GP.A	Phase 2 Mapping and test excavations	

Site Name	Description	Field Rating	Mitigation	Photograph
	main concentration of potsherds on the south-eastern section of the site. The first structure consisted of 6 rocks placed in the shape of a circle/oval and it measured approximately 1.2 m x 0.8 m in size. The second structure was similar in shape and size but consisted of seven packed rocks. These two small structures could possibly be the remains of grain-bin foundations. No other structures, finds or features were identified here. Site size: Approximately 150 m in diameter.			

9.12 Description of the Current Land Uses

The Project area is bound by the Limpopo River to the north, the proposed Boikarabelo Coal Mine to the southwest and game farms to the west and east and is characterised by gently rolling plains that dip to the north and west towards the Limpopo River valley. There are limited and occasional small crests or hills throughout the Project area. The predominant land use in the region and within the Project area is game farming and agriculture; land use is dominated by grazing due to the low arable agricultural potential. Game farming and hunting is dominant within the Project site. The Project site has been impacted due to overgrazing activities, with limited ground cover on site. The exposed soil limits the available habitats on site and is a source for soil erosion and wind-blown dust. The overgrazing activities may impact on the long term viability of the Project area to be used for game farming.

Land capability is determined by a combination of soil, terrain and climatic features. Land capability classification is defined as the sustainable, long term use of land under rain-fed conditions. Soil properties, as well as their limitations, associated with the various land use classes are also taken into consideration. The dominant land capability for the Project area is Class VI which is classified as non-arable, moderate grazing potential.

9.12.1 Land Claims

The Provincial Land Claims Commissioner was informed on 11 August 2015, by means of a formal letter, requesting confirmation if any land claims exist on the farms Koert Louw Zyn Pan, Draai Om, Nazarov, Witkopje and Doornkopje. A response was received on 14 October 2015 stating that there is no information pertaining to land claims for the directly affected and adjacent properties.

9.13 Description of Specific Environmental Features and Infrastructure on the Site

9.13.1 Water Resources

The proposed Kubu Coal Mine falls within the Limpopo WMA1 and within quaternary catchment A41E. The Limpopo River borders the northern extent of the Project area, with a meander arm tributary of the Limpopo River located within the Project site. The meander arm tributary is in the process of gradually becoming an oxbow lake. According to Ashton *et al.* (2001), the Limpopo River was a strong historical perennial system which is now a dryland river with surface flow ceasing entirely in the winter dry season (LBTPC, 2010).

Groundwater quality within the Project area has elevated concentrations of sulphates, chlorine, calcium and sodium. The elevated concentrations are naturally occurring ions in the groundwater and are associated with the Karoo aquifers and their mineralogy, as well as slow groundwater recharge. The current surface water sites around the proposed Kubu Coal Mine area are characterised by high chloride concentrations that are naturally occurring.

Wetlands cover an area of 377.97 ha of the Project area, with 92% of the wetland area attributed to the Limpopo River floodplain. The PES of all non-riparian wetlands were allocated a PES of Class C, or moderately modified, and the Limpopo River floodplain was allocated a PES of Class D, or largely modified. The EIS of the wetlands were considered to be moderate to low. The wetland HGM units and respective areas include:

- Floodplain wetlands (349.28 ha);
- Hillslope seepage (21.63 ha); and
- Valley bottom un-channelled wetland (7.06 ha).

The PES of the aquatic environment of the reach of Limpopo River assessed is categorised as Class C which is moderately modified.

9.13.2 Terrestrial Landscape Habitat

The topography of the Project area is relatively flat, with limited rolling crests located intermittently throughout the Project site. The proposed Kubu Coal Mine falls within the Limpopo Sweet Bushveld (Mucina and Rutherford, 2006) and consists of plains and short, open mixed thornveld. The Project site has been categorised predominantly as CBA 1, *irreplaceable*, with the eastern and western extents categorised as CBA 2, *optimal*, areas that should be maintained in their natural state.

The ecological sensitivity of the Project area ranges from medium-low to high sensitivity, based on the fauna and flora baseline investigation. The areas associated with the tributary of the Limpopo River, namely the delineated *Ziziphus mucronata* Riparian Woodland in the north of the Project area, were determined to have a high ecological sensitivity, with the remaining areas associated with the *Acacia mellifera* Mixed Thornveld determined to have a medium-low ecological sensitivity.

Three nationally protected tree species were identified on site and these include Leadwood (*Combretum imberbe)*, Camel Thorn (*Vachellia erioloba* (previously *Acacia erioloba*)) and Shepard's Tree (*Boscia albitrunca),* the latter two having being identified in the *Acacia mellifera* Mixed Thornveld. Four SSC were previously observed in the Project area, namely the Leopard (*Panthera pardus*), White Rhinoceros *(Ceratotherium simum)*, Honey Badger (*Mellivora capensis*) and Sable Antelope (*Hippotragus niger niger)* and a total of 8 bird SSC were observed.

Slight depressions and crests occur within the Project area; the crests consist of carbonate, with the depressions consisting of deeper, red soil. The red soils represent the Hutton or Kimberley soil forms; the deeper soils within the Project area are predominantly Hutton soils, and are approximately 0.8 m or more in depth. The chemical and physical properties of selective soils samples indicate that the soils are characterised by naturally low phosphorus (P) levels and, thus, the soils have very low fertility.

The land capability has been determined by the soil types identified on site. The rocky areas are classified as Class VI, moderate grazing potential. Hutton soils are usually associated with moderate cultivation, although due to climatic conditions this has been reduced to Class VI as the soil capabilities will not reach their potential.

9.13.3 Cultural Heritage

The 2009 Koert Louw Zyn Pan AIA identified more than 200 archaeological sites in the landscape, as well as two contemporary sites (but no burial grounds). Other studies undertaken by Digby Wells in the region identified 18 burial grounds, 30 historic and 4 more recent / contemporary sites on surrounding farms.

The study area also contains moderate to high palaeontological sensitivity. The study area is therefore clearly located within a rich heritage landscape with great temporal depth.

9.13.4 Infrastructure

The proposed Kubu Coal Mine is located approximately 55 km northwest of Lephalale, with Steenbokpan being the nearest town, 17 km to the southeast. There are no settlements within the Project area, although individual households do occur along the western extent of the Project site. There are gravel roads along the periphery of the Project area, as well as intermittent roads throughout the Project site. The D2286 gravel road is located 1.8 km to the south of the Project area. There is no infrastructure located on the Project site.

9.14 Environmental and Current Land Use Map

The environmental and land use features for the Project are detailed in the respective plans in Appendix A, as referenced in Table 9-48.

Table 9-48: Environmental and Land Use Features Plans

Environmental Feature	Plan Number
Soil Types	Plan 6
Land Capability	Plan 7
Regional Vegetation	Plan 8
Vegetation Communities	Plan 9
Ecological Sensitivity	Plan 11
NFEPA Wetlands	Plan 13
Delineated Wetlands	Plan 14
Heritage Resources	Plan 18
Composite Plan	Plan 24

10 Item 3(g)(v): Impacts and Risks Identified including the Nature, Significance, Consequence, Extent, Duration and Probability

The potential impacts associated with the Project have been identified as part of the specialist investigations undertaken for the Kubu Coal Mine Project, as well as from input provided by affected parties through consultations and submitted comments. The significance of the potential impacts has been assessed by the specialists as part of the respective Impact Assessment reports.

The potential impacts, potential mitigation and management measures for the impacts and the significance rating prior to and post mitigation have been provided in the sections below per environmental aspect and activity. The activities associated with the Kubu Coal Mine Project area, which may result in potential impacts, are detailed in Table 5-1 and have been summarised as follows:

- Site Clearance (in preparation of infrastructure development and open pit establishment);
- Haul and Access Roads;
- Infrastructure Area, which includes:
  - Workshop and change rooms;
  - Offices;
  - Security room; and
  - Pipelines.
- ROM tip area, including:
  - Crushing station;
  - Stockpile; and
  - Transportation of coal via conveyor.
- PCDs, including storm water management;
- Open pit mining (including drilling and blasting);
- Storage of Overburden;
- Topsoil berm; and
- Rehabilitation.

The methodology used to determine the significance of the potential impacts is provided in Section 10.5. The potential impacts have been discussed per phase of the Project, per environmental aspect and according to each activity.

The impact ratings described in the following sections do not constitute the entire array of impacts that have been assessed by the various specialists. The impacts highlighted here are those considered significant; all negligible and minor negative and positive impacts ratings have not been included, although they have been discussed. Please refer to the individual specialist studies for a detailed impact assessment of all potential impacts identified.

Potential Project risks, such as hydrocarbon spillages, pipeline leaks, flooding of the PCDs and storm water management facilities have not been assessed as part of the impact assessment as the probability of these events occurring are not covered by the impact assessment methodology. Mitigation and management measures to prevent Project risks from occurring have been provided in the EMP section of this report. Mitigation and management measures for Project risks are detailed in Section 11.2, Part B.

10.1 Construction Phase

The construction phase consists of site clearing, which includes the removal of vegetation and soil, and the construction and development of infrastructure associated with the Project. The topsoil berm will also be developed during the construction phase. For ease of reference, the overburden dump will be assessed as an activity associated with the construction phase and rated to take into account the life of the Project. The potential impacts during the construction phase, per environmental aspect, are discussed below.

10.1.1 Air Quality Impacts

Activities undertaken during the construction phase, such as site clearing, soil handling, infrastructure development and vehicle movement on site have the potential to impact on ambient air quality due to the generation of fallout dust and PM. The interaction and impacts on air quality during the construction phase are summarised in Table 10-1.

Table 10-1: Interactions and Impacts on Air Quality during the Construction Phase

Interaction	Impact
Site clearing	Direct reduction in the quality of ambient air due to airborne dust.
Exposure of loose soils due to loss of vegetation cover	Wind erosion of loose particulate matter.
	Direct reduction in the quality of ambient air due to airborne dust.

10.1.1.1 Site Clearing, Infrastructure Area and Topsoil Berm

10.1.1.1.1 Impact Description

The removal of vegetation, stripping and handling of topsoil and grading of the surface topography may lead to the generation of fugitive dust emissions comprising of Total

Suspended Particles (TSP), $PM_{2.5}$ and PM_{10}. Site clearing will take place prior to the construction or development of any infrastructure. The movement of contractors, vehicles and equipment on site will result in the generation of dust, as well as the compacting of soil surfaces; the latter resulting in the susceptibility of soil erosion which further exacerbates the potential for dust generation.

10.1.1.1.2 Management Objectives

The management objective is to ensure that dust emissions associated with site clearing comply with regulatory standards for the protection of the environment and human health and well-being. The on-site and off-site airborne dust levels must comply with the relevant health protection criteria. The dust levels must not exceed the NDCR, 2013, non-residential rates on-site and the PM levels must not exceed the NAAQS limits.

10.1.1.1.3 Management Actions and Targets

Dust fallout monitoring must take place upwind and downwind of sensitive receptors and must not exceed the non-residential limit of 1 200 $mg/m^2/day$ at the mine boundary. Dust suppressants must be utilised on haul roads and exposed areas to limit dust generation. It is also recommended that PM_{10} monitoring be undertaken.

All monitoring results are to be maintained on a logging sheet for reference and proof of compliance to the air quality standards - PM_{10} (75 ug/m^3) and dust fallout (1 200 $mg/m^2/day$) at the mine boundary.

10.1.1.1.4 Impact Rating

The pre-mitigation and post mitigation impact ratings, as well as the mitigation measures to be implemented, are provided in Table 10-2.

Table 10-2: Pre-Mitigation and Post-Mitigation Potential Impacts on Air Quality during the Construction Phase

Site Clearing, Infrastructure Area and Topsoil Berm			
Dimension	**Rating**	**Motivation**	**Significance**
Impact Description: Generation of dust due to site clearing activities, as well as the construction of infrastructure and topsoil berm			
Prior to mitigation/ management			
Duration	Medium term (2)	Dust will be generated for the duration of the construction phase	Minor (negative) - 42
Extent	Local (3)	Airborne dust may extend across the development site area.	
Intensity	Minor (2)	Minor effect on the surrounding area is anticipated	

Probability	Almost certain (6)	There is a possibility that generated dust will impact ambient air quality.	
Nature	Negative		
Mitigation/ Management actions			
▪ Application of dust suppressants on haul roads; ▪ Only areas earmarked for infrastructure or the open pit must be cleared, no unnecessary site clearing must take place; ▪ The topsoil berm must be vegetated; ▪ practically possible; and ▪ Speed limits must be enforced on site to limit dust generation.			
Post- mitigation			
Duration	Short term (2)	Dust generation will be limited to the area disturbed	Negligible (negative) - 20
Extent	Very Limited (1)	After mitigation measures are implemented, It is expected that dust impacts will be limited to isolated parts of the site.	
Intensity	Minimal (1)	Generated dust will have limited impact on a small area and have minimal social impact	
Probability	Likely (5)	Possibility of impacting ambient air quality is very low.	
Nature	Negative		

10.1.2 Soil, Land Use and Land Capability Impacts

The potential impacts to soil resources during the construction phase relate to the disturbance of the natural soil state. When soil is stripped, the physical properties are changed and this impacts on the soils' health. During soil stockpiling, the soils' chemical properties may deteriorate unless properly managed. These all lead to the loss of the topsoil layer as a natural resource. Soil is considered a slowly regenerating resource due to the fact that it takes hundreds of years for a soil profile to gain 10 cm of additional soil through natural processes. During a single rainfall event on unprotected bare soil, erosion could remove that same amount of soil.

Vehicles will drive on the soil surface during the construction phase, thereby compacting the soils. This reduces infiltration rates as well as the ability for plant roots to penetrate the compacted soil. This in turn reduces vegetative cover and increases runoff potential. The increased runoff potential then leads to increased erosion hazards.

If the topsoil and subsoil are stripped and stockpiled as one unit, the topsoil's seed bank and natural fertility balance is diluted. This may affect the regrowth of vegetation on the stockpiles as well as the regrowth when they have been replaced during the rehabilitation process. The interactions and impacts associated with soil resources during the construction phase are outlined in Table 10-3.

Table 10-3: Interactions and Impacts on Soil Resources during the Construction Phase

Interaction	Impact
Site clearance and topsoil removal prior to the commencement of physical construction activities.	Loss of topsoil as a resource – Disturbance, Erosion, and Compaction
	Loss of Land Capability
The construction of stockpiles, including the topsoil berm, and other loading areas.	Loss of topsoil as a resource – Disturbance, Erosion, and Compaction.

10.1.2.1 Site Clearance and Topsoil Berm

10.1.2.1.1 Impact Description

The soil profile and soil resources are compromised once the soil has been stripped, disturbed, compacted or eroded and its ability to function as a growth medium is restricted. The movement of heavy machinery on the soil surfaces during site clearance and construction activities causes compaction of the soils which reduces the vegetation's ability to grow, increasing the risk of soil erosion.

In addition, the cleared land may increase the runoff potential of the area, further exacerbating the potential for erosion to occur. The loss of topsoil as a resource is considered a negative impact as the natural regeneration of soil takes hundreds of years. Furthermore, the change in land use, as well as the potential impact to soil resources may impact in turn on the Project area's land capability. The land capability will reduce from classifiable to non-classifiable.

10.1.2.1.2 Management Objectives

The management objectives are to limit the loss of topsoil resources through erosion and compaction and to maintain the soil resources in a fertile state to be used for rehabilitation following closure of the Kubu Coal Mine.

10.1.2.1.3 Management Actions and Targets

To ensure that the soils are maintained in a fertile state, bush clearing of all bushes and trees taller than one meter must be preferably undertaken first during site clearance, or during the site clearance of the topsoils. This vegetation must be placed, where possible dependant on safety risks, within the topsoil stockpiles or berm footprint. The topsoil and the remaining vegetation must be stripped as per the Rehabilitation Plan and placed on top of the previously cleared bushes and trees. This methodology will create a source of organic matter for the topsoil to regenerate with as well as to increase the success of re-vegetating the stockpiles and later the rehabilitated area.

All operational areas within the mine, such as the topsoil berm, open pit, infrastructure areas and haul and access roads must be monitored for erosion and corrective measures must be undertaken should erosion occur.

10.1.2.1.4 Impact Rating

The pre-mitigation and post mitigation impact ratings, as well as the mitigation measures to be implemented, are provided in Table 10-4.

Table 10-4: Pre-Mitigation and Post-Mitigation Potential Impacts on Soils during the Construction Phase

Site Clearing and Topsoil Berm			
Dimension	**Rating**	**Motivation**	**Significance**
Impact Description: The loss of topsoil as a resource due to compactions and erosion.			
Prior to mitigation/ management			
Duration	Project Life (5)	Topsoil will be stripped and stockpiled if this is done without following the mitigation measures the impact will have a long term affect.	Minor (negative) - 63
Extent	Very Limited (1)	Loss of topsoil will only occur within and immediately around the Project site.	
Intensity	Moderate (3)	Loss of topsoil may result in loss of land capability and land use. Soil regeneration takes a very long time.	
Probability	Certain (7)	By excavating the soil it will certainly impact on the soil.	
Nature	Negative		
Mitigation/ Management actions			
▪ The topsoil must be stripped by means of an excavator bucket and loaded onto dump trucks during site clearing. Topsoil must be stripped when the soil is dry and as per the guidelines in the Rehabilitation Plan; ▪ The topsoil berms must be kept to a maximum height of 5 m; ▪ The vegetation must be stripped with the top 0.3 m of topsoil to conserve as much of the nutrient cycle, organic matter and seed bank as possible; ▪ Compacted areas must be ripped to loosen the soil structure following site clearing and on any disturbed areas; ▪ Soil stockpiles must only be used for their designated final purposes; ▪ The stockpiles will be vegetated to reduce the risk of erosion, prevent weed growth and to reinstitute the ecological processes within the soil; ▪ Implement a Storm Water Management Plan; ▪ Should erosion form on cleared areas or topsoil berms, corrective actions, such as erosion berms, must be implemented to minimise any further erosion from taking place; ▪ Topsoil must be sourced and replaced and shaped to reduce the recurrence of erosion should any erosion occur; and ▪ Only the designated access routes must be used to reduce any unnecessary compaction.			
Post- mitigation			

Duration	Project Life (5)	Loss of topsoil makes land less productive. Effects will occur long after the project life.	Negligible (negative) - 27
Extent	Limited (1)	Loss of topsoil will only occur within and immediately around the Project infrastructure area.	
Intensity	Moderate (3)	Loss of topsoil may result in loss of land capability and land use.	
Probability	Unlikely (3)	If the mitigation is followed then it is unlikely that the impacts will occur.	
Nature	Negative		

10.1.3 Fauna and Flora Impacts

Site clearing will result in the direct clearance of vegetation and available habitats, impacting on fauna and flora within the Project site. Areas that will be cleared of vegetation will include the open pit, infrastructure area, overburden dump and ROM tip area and PCDs. The interactions and impacts on fauna and flora during the construction phase are provided in Table 10-5.

Table 10-5: Interactions and Impacts on Fauna and Flora during the Construction Phase

Interaction	Impact
Site clearing for infrastructure placement	Direct loss of floral species/vegetation types and biodiversity.
	Direct habitat loss and degradation.
	Loss of Red Data Species or SSC (protected species).
	Infestation of alien invasive vegetation.

10.1.3.1 Site Clearing

10.1.3.1.1 Impact Description

The removal of vegetation during site clearing will lead to the direct loss of floral species and destroy habitats for many faunal species. Two nationally protected plant species, one of which is Red Data: Declining Status (*A. erioloba* and *C. imberbe)*, have been identified in the open pit area where site clearing will occur. Site clearance will result in the direct loss of vegetation and available habitats and the loss of biodiversity in the area. The uniform habitat of the Project site means that localised habitat destruction and disturbance may impact on all faunal species, including avifauna and bats. Although no bat habitats were identified within the Project site this does not preclude bats from occurring and surrounding habitats would be equally available for bats to utilise. Alien invasive vegetation may establish itself on disturbed area which outcompete indigenous vegetation, further reducing the biodiversity.

10.1.3.1.2 Management Objectives

The predominant objective is to conserve the terrestrial environment and ensure that the biodiversity of the area is maintained. Site clearance will directly remove vegetation and available habitats within the Project area; Red Data and protected species must be conserved as far as possible to ensure that the area can be rehabilitated effectively following the life of the operation.

10.1.3.1.3 Management Actions and Targets

The management actions and targets to enable the objectives to be met include the following:

- Only demarcated operational areas must be cleared of vegetation and for the mining pit this must be undertaken sequentially as the mining progresses;
- Loss of Red Data tree species, such as *A. erioloba*, and the Protected tree, *C.imberbe* are inevitable. It is recommended that a suitable area should be identified where SCC may be conserved in their natural position to compensate for this loss. A biodiversity land management plan[16] will therefore need to be developed for this area; and
- Mine personnel must be trained in environmental awareness and nature conservation.

To conserve the protected species, it is highly recommended that a nursery or conservation area be established to ensure the presence of the plant species is preserved. It is also recommended that a seed bank be collected from the untouched areas of the site to serve as a seed mix during the rehabilitation. It is expected that alien invasive plant species will arise in the disturbed environment and it is recommended that an Alien Invasive Management Programme be developed and implemented.

10.1.3.1.4 Impact Rating

The pre-mitigation and post mitigation impact ratings, as well as the mitigation measures to be implemented, are provided in Table 10-6.

Table 10-6: Pre-Mitigation and Post-Mitigation Potential Impacts on Fauna and Flora during the Construction Phase

Site Clearing			
Dimension	**Rating**	**Motivation**	**Significance**
Impact Description: Loss of vegetation, available habitats, reduction in biodiversity and inevitable loss of SSC.			

[16] The biodiversity action management plan will determine the need for an offset strategy, if any.

Prior to mitigation/ management			
Duration	Beyond project life (6)	The loss of vegetation and habitats will occur beyond the operational phase of the Project.	Moderate (negative) - 91
Extent	Limited (2)	Vegetation and habitat loss will be limited to the Project area.	
Intensity	Long-term (5)	Red Data and Protected species may be destroyed.	
Probability	Certain (7)	Site clearing will occur, removing vegetation.	
Nature	Negative		
Mitigation/ Management actions			
▪ Only demarcated operational areas must be cleared of vegetation; ▪ All protected tree species destroyed during bush clearing must be recorded for replacement purposes during rehabilitation; ▪ A nursery must be established on site; and ▪ A Biodiversity land management plan must be implemented.			
Post- mitigation			
Duration	Beyond project life (6)	The loss of vegetation and habitats will occur beyond the operational phase of the Project.	Moderate (negative) - 84
Extent	Footprint area (1)	Vegetation and habitat loss will be limited to the operational area.	
Intensity	Long-term (5)	Red Data and Protected species may be destroyed.	
Probability	Certain (7)	Site clearing will occur, removing vegetation.	
Nature	Negative		

10.1.4 Aquatics Impacts

Activities associated with the Project may potentially impact the meander arm and the downstream section of the Limpopo River. The potential impacts of the proposed Project on aquatic systems were viewed in light of the PES and EIS classifications. The interactions and impacts on aquatic ecology are provided in Table 10-7.

Table 10-7: Interactions and Impacts on Aquatic Ecology during the Construction Phase

Interaction	Impact
Site clearing for infrastructure placement and development of the open pit.	Increased runoff due to vegetation clearing can result in instream and riparian habitat modification or destruction through erosion, flow, bed, channel and water quality modification.

Interaction	Impact
Construction of infrastructure and topsoil berm.	Water quality deterioration is related to an increase in the amount of suspended/dissolved solids which results in increased sedimentation and changes to the physical chemistry of the water in downstream regions. These physical impacts could lead to reduced aquatic biodiversity. Increased runoff chemicals used in the construction activities have the potential to contaminate downstream aquatic ecosystems

10.1.4.1 Site Clearing and Topsoil Berm

10.1.4.1.1 Impact Description

Site clearing leaves soils susceptible to erosion which can flow into water resources as part of surface runoff. Water quality impacts for the proposed Project include increased dissolved or suspended solids and potential persistent pollutants. In addition, general water chemistry modification can occur as a result of increased metals (aluminium, manganese, cobalt and cadmium) and nutrients (sulphates, total nitrogen and phosphates) as well as modified pH balances, all of which can impact on aquatic ecology. Aquatic habitat quality impacts may include sedimentation, bed, channel and flow modification. The implementation of the 100 m buffer from wetland areas, as well as the berms, infrastructure area and open pit being located outside of the 1:100 year floodline, aims to prevent potential impacts to aquatic ecology.

10.1.4.1.2 Management Objectives

The objective is to preserve the PES of local river systems. This objective can be achieved through the management of potential water and habitat quality impacts.

10.1.4.1.3 Management Actions and Targets

General mitigation measures provided for surface and groundwater impacts will enable the effective management of aquatic resources potentially affected by the proposed Project. However, important management actions are briefly listed below.

The establishment of a buffer zone, which is defined as a region of natural vegetation between the river and the proposed activity, is the primary management action that should be implemented, as per the infrastructure layout provided in Plan 4, Appendix A. Literature suggests that a buffer zone can reduce aquatic habitat and water quality impacts of large developments, making this management action of particular importance (WRC, 2014). The designated buffer zones should then be demarcated using signage.

The removal of vegetative cover for the construction of infrastructure and the open pit has been recognised as being responsible for potential increased runoff, sedimentation and subsequent water and habitat quality degradation in downstream portions of river systems (WRC, 2014). As such the careful management of vegetation removal and sedimentation control should take place. This can be achieved through the brief points below:

- The buffer zones must be maintained by natural vegetation. Although the Project area is currently overgrazed, the initiation of the mining activities will reduce game in the area, restoring natural vegetation;
- Minimise the removal of vegetation in the infrastructure footprint area;
- Establish vegetation of disturbed area;
- Where storm water enters drainage channels, sediment/silt and debris trapping, as well as energy dissipation control measures must be put in place;
- Storm water must be diverted from construction activities and managed in such a manner to disperse runoff and prevent the concentration of storm water flow;
- Sequential removal of the vegetation, particularly with the progression of the mining pit; and
- The vegetation of unpaved roadsides.

To monitor the impacts of the proposed Project effectively, aquatic biomonitoring must take place bi-annually throughout the life of the Project. Techniques used in this study (Ecostatus determination) should be used and monitoring should be done once during the low flow (June and July) and once during the high flow (February and March). The primary target for management is to maintain the PES of the river systems. However, more specific targets are described below.

The monitoring for the presence of the fish species *Micralestes acutidens* and *Barbus trimaculatus* should be completed downstream of the activities. These species have been recorded in abundance in the section (SQR) of the Limpopo River. Although the species are relatively tolerant to poor water quality they are dependent on suitable aquatic habitat and therefore considered an indicator of good habitat. The monitoring programme should illustrate the presence or absence of these species. If the taxa are found to be absent, the study should assess the reasoning for this.

The SASS5, ASPT and MIRAI values should not reduce by more than 15% as a result of activities related to the proposed project. More specific taxa that should be monitored, as well as the implications of their presence/absence in the monitoring program are provided in the table below (Table 10-8).

Table 10-8: Monitoring Taxa, Threshold Diversity/Abundance and Relevance in Monitoring Program

Taxa	Diversity/Abundance	Relevance
Caenidae	Presence/A	Baseline maintenance
Baetidae	>2 species/B	Baseline maintenance
Libellulidae	Presence/A	Improved habitat

10.1.4.1.4 Impact Rating

The pre-mitigation and post mitigation impact ratings, as well as the mitigation measures to be implemented, are provided in Table 10-9.

Table 10-9: Pre-Mitigation and Post-Mitigation Potential Impacts on Aquatics during the Construction Phase

Site Clearing and Topsoil Berm			
Dimension	**Rating**	**Motivation**	**Significance**
Impact Description: Water and habitat quality modification due to siltation of surface water resources.			
Prior to mitigation/ management			
Duration	Medium term (3)	The site clearing for the infrastructure establishment, the initial cut and construction of the topsoil berm will occur over a period of one year.	Minor (negative) - 60
Extent	Local (3)	Due to the distance from the dominant river system, the extent is considered local.	
Intensity	Serious impacts (4)	Water and habitat quality deterioration will be expected to occur downstream of the various activities.	
Probability	Almost certain (6)	Pollution from the proposed activities is almost certainly going to occur as the activities, especially without mitigation.	
Nature	Negative		
Mitigation/ Management actions			
▪ Establish silt traps within clean water channels; ▪ Only areas earmarked for infrastructure or the open pit must be cleared, no unnecessary site clearing must take place; ▪ Disturbed areas adjacent to the required cleared areas must be rehabilitated and vegetation established; ▪ Soils adjacent to the river/wetlands that have been compacted must be loosened to allow for germination of vegetation; ▪ Temporary diversion trenches and berms must be constructed to convey runoff to temporary trenches; ▪ Water management measures must be included in a SWMP and the IWWMP.			
Post- mitigation			

Duration	Medium term (3)	The site clearing and construction of the topsoil berm will occur over a period of one year.	Negligible (negative) - 24
Extent	Local (3)	The mitigation measures will allow the impacts to be kept to a locally impacted extent.	
Intensity	Discernible change (2)	Impacts limited due to mitigation actions.	
Probability	Unlikely (3)	Probability reduced due to mitigation actions.	
Nature	Negative		

10.1.5 Wetlands Impacts

The mine plan has been designed taking into account wetlands and the 1:100 year floodline on site. The open pit and all infrastructure have been located outside of the 1:100 year floodline, as well as 100 m from all delineated wetland areas. The topsoil berm will be located between the open pit and 100 m wetland buffer. Due to the 100 m buffer, there are no impacts anticipated on wetlands for the construction phase. The topsoil berm may be susceptible to erosion; however, eroded topsoil is not expected to impact the wetlands.

10.1.6 Surface Water Impacts

Site clearing and construction activities leave soils susceptible to erosion during rainfall events. The eroded material can impact on surface water resources should it report to the catchment. The interactions and impacts on surface water during the construction phase are provided in Table 10-10.

Table 10-10: Interactions and Impacts on Surface Water during the Construction Phase

Interaction	Impact
Exposure of soils due to loss of vegetation (site clearance).	Siltation of surface water resources may lead to deteriorated water quality.

10.1.6.1 Site Clearing and Topsoil Berm

10.1.6.1.1 Impact Description

Clearing and stripping of vegetation leaves the soils prone to erosion during rainfall events, and as a result runoff from these areas, which will be high in suspended solids, will cause an increase in turbidity in the Limpopo River and its tributaries. The proposed topsoil berms that will be constructed to the north of the proposed open pit, to isolate clean and dirty water, could also be eroded and increase turbidity of the water in the Limpopo River. The topsoil berm will be located 100 m from the wetland areas, as well as outside of the 1:100 year flood line. The siltation of surface water will deteriorate the water quality and potentially impact the downstream water users, as well as the aquatic life.

10.1.6.1.2 Management Objectives

The management objective is to prevent the siltation and subsequent deterioration of quality in the surface water resources.

10.1.6.1.3 Management Actions and Targets

Monitoring of the surface water resources must continue to be undertaken to monitor potential impacts to water quality. TDS concentrations for the monitoring locations are already considered to be high and further impacts to the surface water must be avoided. Regular monitoring of the silt trap and storm water management structure must be undertaken; the silt traps and storm water management structures must be inspected after large storm events to ensure no blockages or breaches. Should blockages or breaches occur immediate action must be undertaken to remove the debris or repair breached areas.

10.1.6.1.4 Impact Rating

The pre-mitigation and post mitigation impact ratings, as well as the mitigation measures to be implemented, are provided in Table 10-11.

Table 10-11: Pre-Mitigation and Post-Mitigation Potential Impacts on Surface Water during the Construction Phase

Site Clearing and Topsoil Berm			
Dimension	**Rating**	**Motivation**	**Significance**
Impact Description: Sedimentation of surface water resources resulting in deteriorated water quality.			
Prior to mitigation/ management			
Duration	Medium term (3)	Equal to the duration of the construction phase	Minor (negative) - 70
Extent	Local (3)	The impacts will be localised to the nearby water resources from where the silt is being generated and the immediate downstream	
Intensity	Moderately high (4)	This will have moderate impacts resulting in a limited ecosystem functionality for downstream users	
Probability	Certain (7)	Without appropriate mitigation there will definitely be significant erosion	
Nature	Negative		
Mitigation/ Management actions			

- Implement a Storm Water Management Plan;
- Corrective actions, such as erosion berms, must be implemented to minimise any further erosion from taking place should any erosion occur;
- All runoff emanating from the dirty water areas must be diverted through a silt trap prior to entering the PCDs;
- Application of dust suppressants on haul roads;
- Only areas earmarked for infrastructure or the open pit must be cleared, no unnecessary site clearing must take place; and
- The topsoil berm must be vegetated.

Post- mitigation			
Duration	Medium term (3)	Equal to the duration of the construction phase	Minor (negative) - 36
Extent	Local (3)	The impacts will be localised to the nearby water resources from where the silt is being generated and the immediate downstream	
Intensity	Moderate (3)	Mitigation will reduce the impacts	
Probability	Probable (4)	Necessary mitigations will reduce the erosion probability significantly	
Nature	Negative		

10.1.7 Groundwater Impacts

The construction phase of the project will predominantly consist of site clearing and infrastructure development. The activities are likely to take place above the groundwater table and, thus, potential impacts to groundwater are limited. The interactions and impacts are summarised in Table 10-12.

Table 10-12: Interactions and Impacts on Groundwater during the Construction Phase

Interaction	Impact
Removal of topsoil and vegetation and construction of infrastructure and haul roads.	Compaction of soil will increase water runoff and thereby decrease groundwater quantity through reduced recharge.

10.1.7.1 Site Clearing, Infrastructure Area and Haul and Access Roads

10.1.7.1.1 Impact Description

The clearing of vegetation and use of heavy vehicles and machinery will result in compacted areas which increases the runoff of the area. In addition, the establishment of hard surface areas also increases water runoff, thereby reducing the recharge to the shallow weathered aquifers.

10.1.7.1.2 Management Objectives

The management objectives are to limit compaction and to rehabilitee disturbed areas following construction. The collected water runoff from the infrastructure areas should be used throughout the Project site to ensure no water is wasted.

10.1.7.1.3 Management Actions and Targets

Areas demarcated for site clearing and construction, as well as vehicle movement, must be clearly designated to prevent unnecessary compaction an impacts to adjacent areas and limiting the area of disturbance. Disturbed areas should be rehabilitated and vegetated within 3 months.

10.1.7.1.4 Impact Rating

The pre-mitigation and post mitigation impact ratings, as well as the mitigation measures to be implemented, are provided in Table 10-13.

Table 10-13: Pre-Mitigation and Post-Mitigation Potential Impacts on Groundwater during the Construction Phase

Site Clearing, Infrastructure Area and Haul and Access Roads			
Dimension	**Rating**	**Motivation**	**Significance**
Impact Description: Reduction in recharge of shallow aquifers.			
Prior to mitigation/ management			
Duration	Medium term (3)	Soil compaction should only take place during construction, but may last after this phase.	Minor (negative) - 40
Extent	Limited (2)	Compaction will only occur within and immediately around the Project site.	
Intensity	High (3)	Reduces groundwater recharge.	
Probability	Likely (5)	It is likely that compaction will occur during construction.	
Nature	Negative		
Mitigation/ Management actions			
▪ Rehabilitate disturbed areas once construction has concluded; and ▪ Only the designated access routes must be used to reduce any unnecessary compaction.			
Post- mitigation			
Duration	Short term (2)	Soil compaction effects will be reversed within 1 year.	Negligible (negative) - 21
Extent	Limited (2)	Compaction will only occur within and immediately around the Project site.	
Intensity	Moderate (3)	Reduction on groundwater recharge in the immediate area.	

Probability	unlikely (3)	It is unlikely that compaction will have an effect after rehabilitation.	
Nature	Negative		

10.1.8 Noise Impacts

Predictive modelling was performed for the proposed activities through the use of the modelling software SoundPlan. The software specialises in computer simulations of noise pollution dispersion. Estimates of the cumulative mining noise levels from the study were derived from the noise emissions from all the major noise-generating components and activities of the proposed Project. The noise dispersion modelling software was used to assess whether the noise from the proposed project activities will impact on the relevant noise sensitive receivers, by comparing the predicted propagating noise levels with the ambient baseline noise levels.

According to the National Noise Control Regulations, "disturbing noise" means a noise level which exceeds the zone sound level or, if no zone sound level has been designated, a noise level which exceeds the ambient sound level at the same measuring point by 7 dBA or more. The noise dispersion model for the construction phase indicated that the expected noise will not measure above the existing baseline at the nearest sensitive receptors. The noise dispersion model for the construction phase is provided in Plan 19, Appendix A. The interactions and impacts associated with the construction phase are included in Table 10-14.

Table 10-14: Interactions and Impacts Associated with Noise during the Construction Phase

Interaction	Impact
Machinery, equipment and vehicles used during site clearing and construction for all infrastructure on site.	Generation of noise.

10.1.8.1 Site Clearing and Infrastructure Area

10.1.8.1.1 Impact Description

Noise will emanate from machinery, equipment and vehicles operating during the site clearing and construction activities. The noise levels will not exceed the baseline noise levels.

10.1.8.1.2 Impact Rating

The pre-mitigation and post mitigation impact ratings, as well as the mitigation measures to be implemented, are provided in Table 10-15.

Table 10-15: Pre-Mitigation and Post-Mitigation Potential Impacts due to Noise during the Construction Phase

Site Clearing and Infrastructure Area			
Dimension	**Rating**	**Motivation**	**Significance**
Impact Description: Noise will emanate from the machinery and vehicles.			
Prior to mitigation/ management			
Duration	Medium term (3)	Noise will be produced for the duration of the construction phase	Negligible (negative) - 21
Extent	Local (3)	It is expected that during construction noise will extend as far as the development site area.	
Intensity	Minimal (1)	It is expected that during construction noise will have a minimal impact	
Probability	Unlikely (3)	It is unlikely that noise will impact on the surrounding receptors.	
Nature	Negative		
Mitigation/ Management actions			
▪ Restricting construction activities to daylight hours (06:00 to 18:00); ▪ Construction machinery, equipment and vehicles must be serviced to the designed requirements of the machinery/vehicles to ensure noise suppression mechanisms are effective e.g. installed exhaust mufflers; and ▪ Switching off equipment when not in use.			
Post- mitigation			
Duration	Short term (2)	Noise will be produced for the duration of the construction phase.	Negligible (negative) - 12
Extent	Local (3)	It is expected that during construction noise will be limited to site if mitigation measures are implemented.	
Intensity	Minimal (1)	It is expected that during construction noise will have a minimal social impact.	
Probability	Rare (2)	It is improbable that noise will impact on the surrounding receptors.	
Nature	Negative		

10.1.9 Socio-Economic Impacts

The Social Impact Assessment was undertaken by Masimong and is attached in Appendix K. The Social Impact Assessment undertaken by Masimong utilises a separate qualitative impact assessment. The qualitative methodology used by Masimong is the same qualitative methodology implemented by Digby Wells, with the exception that Digby Wells has assigned quantitative values to the qualitative assessment. For ease of reference, the qualitative assessment has been incorporated into the quantitative Digby Wells methodology. It must also be noted that post mitigation and post enhancement measures are not assessed by Masimong, although mitigation and enhancement measures are provided.

The potential socio-economic impacts are complex in nature as the potential impacts are multi-dimensional, interrelated and mutually reinforcing. In addition, the potential socio-economic impacts may not result from individual Project activities, but due to the presence of the Project as a whole or a combination of activities; the driving factors behind potential socio-economic activities are not easily determined. For ease of reference throughout this report, the Project activity "*Employment and Procurement*" will be used to refer to all potential socio-economic impacts and their related mitigation measures, although the potential impacts may result from a combination of activities.

The interactions and impacts on the socio-economic environment during the construction phase are summarised in Table 10-16.

Table 10-16: Interactions and Impacts on the Socio-economic Environment during the Construction Phase

Interaction	Impact
The use of contractors and implementation of the Kubu Coal Mine.	The influx of contractors will result in social impacts such as population influx and pressure on resources and services. This may also result in the establishment and growth of informal settlements; increase in social pathologies and conflict / competition between newcomers and incumbent population.
	Contractors will be required to hire from the local communities, having a positive impact on local employment and development.
	Kubu Coal Mine has SLP commitments which will commence from the granting of the Mining Right. The SLP will include training and skills upliftment commitments, positively impacting on local communities.

10.1.9.1 Employment and Procurement

10.1.9.1.1 Impact Description: Population Influx

Contractors will be utilised for the construction and development services required for the Project. The influx of contractors with their non-resident workforce can lead to many social impacts due to local expectations and perceptions, as well as various integration issues impacting on health and security. The potential impacts that may arise includes population influx of non-resident workforces which results in potential social issues due to integration with local communities, increased demand on health and emergency services and unrealistic expectations by local communities which may lead to unrest. Social ills that may result through population influx also includes xenophobia, expansion of development of informal settlements and an increase in crime, safety issues and social pathologies.

10.1.9.1.2 Management Objectives

Management objectives will be to minimise and manage the potential negative impacts associated with population influx in consultation with the LLM.

10.1.9.1.3 Impact Rating

The summary of the potential socio-economic impacts as a result of the Project is included in Table 10-17.

Table 10-17: Interactions and Impacts on the Socio-Economic Environment during the Construction Phase

Employment and Procurement			
Dimension	**Rating**	**Motivation**	**Significance**
Impact Description: Population influx and the related social ills and impacts.			
Prior to mitigation/ management			
Duration	Beyond project life (6)	Population influx may occur from the Construction Phase and last during the Life of Mine.	Moderate (negative) - 102
Extent	Provincial (5)	Majority of the workforce will likely originate from the local labour pool of the local municipalities, however influx may have impacts on the Limpopo Province.	
Intensity	Very High (6)	Influx will likely exacerbate existing negative social conditions in several ways: increased social pathologies, pressure on service, conflict between locals and non-locals and establishment of informal settling	
Probability	Almost certain (6)	Pressure on services and growth of local communities is already a problem	
Nature	Negative		
Mitigation/ Management actions			
- Ensure expectations within the communities and local SMMEs regarding local recruitment and local procurement, amongst other matters are managed effectively through continuous engagements; - Ensure effective stakeholder management through various communication engagement mediums with stakeholders regarding the possible use of contractors, local recruitment plans, as well as preferential procurement initiatives; - Implement contractor specifications to ensure that contractors are committed to the obligations of the mine with regards to local recruitment and procurement, as well as legislative and company specific obligations with regards to housing and living conditions; - Constant monitoring of the region to prevent the establishment of informal settlements through partnership with the South African Police Services; and - Establishing a grievance procedure to provide support to victims of social disarrays.			

10.1.9.1.4 Impact Description: Local Recruitment and Social and Labour Plan Commitments

Contractors will be obligated to recruit unskilled and some semi-skilled positions from the local communities, as well as procure as far as possible from the local SMME's. The recruitment from local communities will have a positive impact on the local economy, as well as improving the lifestyle for the employed personnel. This positive impact will occur for a short duration as the construction phase is anticipated to last for one year.

In addition, WOC has an SLP which outlines the mine's commitments to the surrounding communities. The SLP will entail the upliftment of local skills through training programmes which will enable local community members to apply for jobs. Income will be generated in the region due to the increased skills, as well as LED programmes implemented. In addition, infrastructure and services will be established and upgraded, benefitting the local communities. The impact as a result of the SLP is provided in Table 10-18.

10.1.9.1.5 Management Objectives

National legislation (MPRDA), as well as international best practice (Performance Standards of the International Finance Corporation (IFC)), requires that affected communities are given special consideration in terms of the benefits arising from a Project. The objectives are to prioritise affected communities to ensure those affected by the Project receive the benefits.

10.1.9.1.6 Impact Rating

The summary of the potential socio-economic impacts during the construction phase of the Project is included in Table 10-18.

Table 10-18: Impacts on the Socio-Economic Environment during the Construction Phase

Employment and Procurement			
Dimension	**Rating**	**Motivation**	**Significance**
Impact Description: Income generation and employment opportunities for local communities			
Prior to mitigation/ management			
Duration	Medium term (3)	The construction phase will last for approximately 1 year.	Minor (positive) 77
Extent	Local (3)	Majority of the workforce will likely originate from the local labour pool of the local municipalities, with SLP commitments targeting local communities.	
Intensity	High (5)	The employment opportunities for local communities will have a significant positive impact.	

Probability	Certain (7)	SLP commitments will require employment from local communities. Contracts with construction activities will ensure local communities are prioritised.	
Nature	Positive		
Mitigation/ Management actions			
▪ Include the recruitment of local employees, especially unskilled and semi-skilled individuals to align to the WOC's Employment Equity plans; ▪ Orientate contractors on the utilisation of the local community database through which local residents are identified for recruitment, as well as the local SMME database for local preferential procurement; ▪ Conduct regular compliance audits to ensure that contractual obligations are adhered to by all contractors, including, but not limited to: local recruitment, local procurement and housing and living conditions by contractors. ▪ Implement contractor specifications to ensure that contractors are committed to the obligations of the mine with regards to local recruitment and procurement, as well as legislative and company specific obligations with regards to housing and living conditions.			
Employment and Procurement			
Dimension	**Rating**	**Motivation**	**Significance**
Impact Description: Skills upliftment and training and infrastructure upgrades as part of the SLP commitments			
Prior to mitigation/ management			
Duration	Project life (5)	The SLP commitments will be for the duration of the Project life.	Moderate (positive) 91
Extent	Local (3)	Majority of the workforce will likely originate from the local labour pool of the local municipalities, with SLP commitments targeting local communities.	
Intensity	High (5)	The upliftment of skills, income generation through LEDs and the establishment and upgrading of infrastructure will have a high positive impact.	
Probability	Certain (7)	SLP commitments will be undertaken.	
Nature	Positive		
Mitigation/ Management actions			
▪ Implement career guidance within the core and affected communities identified through this study, to orientate school children with regards to which subjects are required to obtain mining technical or non-technical qualifications; and ▪ Implement education programmes regarding health and nutrition, as well as personal finance management to mention a few.			

10.1.10 Cultural Heritage Impacts

An AIA was undertaken in 2009 and submitted to SAHRA. The 2009 AIA identified more than 200 archaeological sites in the landscape, as well as two contemporary sites (but no burial grounds). SAHRA has provided comment on the AIA and mitigation measures have been confirmed for the heritage resources within the Project area. The mitigation measures need to be undertaken prior to the site clearing activities as site clearing will impact on the heritage resources. The heritage resources are provided in Plan 18, Appendix A, with the heritage resources located within the operational areas and their mitigation measures provided in Table 10-19, with the heritage resources within the 500 m blast radius but outside of the operational areas provided in Table 10-20. The full description of the heritage resources are provided in Table 9-47.

Table 10-19: Directly Impacted Heritage Resources and Required Mitigation

Site Name	Field Rating	Mitigation
2327CA-PGS002	GP.A	Phase 2 Mapping and test excavations
2327CA-PGS008		
2327CA-PGS015		
2327CA-PGS036		
2327CA-PGS037		
2327CA-PGS039		
2327CA-PGS044		
2327CA-PGS004	GP.B	Phase 2 Shovel Test Pit
2327CA-PGS005		
2327CA-PGS014		
2327CA-PGS006	GP.C	No further mitigation - Monitoring
2327CA-PGS007		
2327CA-PGS016		
2327CA-PGS017		
2327CA-PGS018		
2327CA-PGS019		
2327CA-PGS020		
2327CA-PGS038		
2327CA-PGS042		
2327CA-PGS043		

Table 10-20: Indirectly Impacted Heritage Resources and Required Mitigation

Site Name	Field Rating	Mitigation
2327CA-PGS010	GP.A	Phase 2 Extensive Documentation
2327CA-PGS003	GP.B	Phase 2 Shovel Test Pit
2327CA-PGS001	GP.C	No further mitigation - Monitoring
2327CA-PGS009		

There is the possibility the unidentified heritage resources exist within the Project area. As a result, the Project activities' interactions and resultant impacts are provided in Table 10-21.

Table 10-21: Interactions and Impacts on Heritage Resources during the Construction Phase

Interaction	Impact
Site clearing may uncover unidentified heritage resources.	Permanent destruction of potential heritage resources of cultural significance.

10.1.10.1 Site Clearing

10.1.10.1.1 Impact Description

There were plentiful archaeological and contemporary heritage resources identified within the Project area. It is necessary to note, however, that archaeological and heritage resources located during the fieldwork do not necessarily represent all of the heritage resources within the Project area. This may be due to various reasons, such as the subterranean nature of some archaeological sites and localised dense vegetation cover. During site clearance, there is a possibility that heritage resources may be uncovered. Site clearing activities have the potential to destroy or damage unidentified heritage resource which may have a significant impact should the heritage resource by of cultural significance. Conversely, should the heritage resources be identified and recorded, this will be considered a positive impact.

10.1.10.1.2 Management Objectives

The objective is to avoid the destruction of unidentified heritage resources, but rather to identify heritage resources and preserve the resource through record.

10.1.10.1.3 Management Actions and Targets

A comprehensive Chance Find Procedure (CFP) was developed for the adjacent Boikarabelo Coal Mine. It is recommended that the CFP for Boikarabelo Coal Mine, or alternatively a CFP developed for Kubu Coal Mine, be implemented during site clearing activities.

10.1.10.1.4 Impact Rating

The pre-mitigation and post mitigation impact ratings, as well as the mitigation measures to be implemented, are provided in Table 10-22.

Table 10-22: Pre-Mitigation and Post-Mitigation Potential Impacts on Heritage Resources during the Construction Phase

Site Clearing			
Dimension	**Rating**	**Motivation**	**Significance**
Impact Description: Potential damage or destruction of unidentified heritage resources.			
Prior to mitigation/ management			
Duration	Permanent (7)	The damage or destruction of unidentified heritage resources will be permanent.	Moderate (negative) - 100
Extent	National (6)	Any unmitigated loss of heritage resources of cultural significance will be of national concern.	
Intensity	Very high (7)	The permanent loss of heritage resources of cultural significance will be considered a very high negative impact.	
Probability	Likely (5)	There is a probable chance of damaging and destroying unidentified heritage resources, based on previous work completed in the area.	
Nature	Negative		
Mitigation/ Management actions			
▪ Implementation of the Boikarabelo Coal Mine CFP, or the development and implementation of CFP specific to Kubu Coal Mine.			
Post- mitigation			
Duration	Immediate (1)	Any impact on heritage resources will be immediate	Negligible (positive) 33
Extent	Region (5)	Removing heritage resources, especially archaeology, will impact on a regional understanding of the heritage landscape: understanding of expressions of archaeological record will increase if CFP are implemented.	
Intensity	Serious (5)	Implementation of the recommended CFP will enable a positive contribution to be made to retention of scientific information	
Probability	Unlikely (3)	The CFPs will increase the probability of identifying heritage resources and reduce the risk of damage or destruction of unidentified resources.	
Nature	Positive		

10.2 Operational Phase

The operational phase will consist predominantly of mining activities which include the drilling and blasting of overburden and interburden rock, the truck and shovel mining of the ROM coal, transport of overburden and ROM coal by truck to the overburden dump and ROM tip area, respectively, the crushing of ROM coal and subsequent transport via overland conveyor to the adjacent Boikarabelo Coal Mine. In addition, storm water management will be undertaken which aims to separate clean and dirty water areas; water run-off from the infrastructure area, ROM tip area and overburden dump will be diverted by drains and cut-off trenches to the PCDs. The topsoil berm will ensure that the open pit dirty water area is separated from the clean water and wetland areas to the north.

10.2.1 Air Quality Impacts

The activities that are likely to result on impacts to air quality include the open pit mining, such as drilling and blasting activities, vehicle movement transporting ROM coal and overburden to the ROM tip area and overburden dump using internal haul roads, crushing of ROM coal and the operation and maintenance of the overburden dump.

Dispersion models were simulated to determine the predicted impacts of $PM_{2.5}$, PM_{10} and dust deposition during the operational phase of the Project. The dispersion model predictions were then used to determine and assess the significance of the potential impacts on the ambient air quality. The details of the dispersion model and emissions inventory utilised is provided in Appendix D.

The maximum unmitigated 24 hour ground level concentration for PM_{10} was 337 µg/m³ and was measured within the mine boundary, with the maximum concentration at the mine boundary measured as 200 µg/m³, both exceeding the current NAAQS limit of 75 µg/m³. The maximum unmitigated predicted annual PM_{10} ground level concentration exceeded the NAAQS limit of 40 µg/m³ in the southwest of the Project site with a concentration of 57 µg/m³.

The maximum unmitigated 24 hour and annual ground level concentrations for $PM_{2.5}$ were predicted as 68 µg/m³ and 42 µg/m³ respectively, both exceeding the NAAQS limits of 65 µg/m³ and 25 µg/m³. The ground level concentrations of $PM_{2.5}$ and PM_{10} were both within the respective limits at the nearest sensitive receptors and across the Botswana border, however, with the concentrations expected to reduce significantly with the implementation of mitigation measures.

The predicted fallout dust deposition rates anticipated from the operation indicates that dust levels may be a cause for concern without the implementation of mitigation measures. The predicted deposition rates outside the mine boundary exceed the NDCR, 2013, non-residential area limits of 1 200 mg/m^2/day, with exposure high along haul roads, the southwest of the Project site and adjacent areas. With the implementation of mitigation measures, the dust deposition rates dropped to below 100 mg/m^2/day at the mine boundary, well within the non-residential area, as well as residential area, NDCR, 2013, limits.

The unmitigated and mitigated dust deposition rates dispersion models are detailed in Plan 20 and Plan 21, Appendix A, respectively. The $PM_{2.5}$ and PM_{10} dispersion models are provided in Appendix D and mirror the dispersion models for the dust deposition, although impacting a lesser aerial extent. The interactions and impacts on air quality during the operational phase are summarised in Table 10-23.

Table 10-23: Interactions and Impacts on Air Quality during the Operational Phase

Interaction	Impact
Dust emission from material handling and wind erosion.	Increased pollutant load in air resulting in poor air quality.

10.2.1.1 Open Pit Mining, ROM Tip Area, Haul and Access Roads and Storage of Overburden

10.2.1.1.1 Impact Description

Open pit mining will require the drilling and blasting of overburden and interburden rock. The drilling and blasting fragments overburden and coal to allow for mining activities to be undertaken; blasting in particular will result in fugitive dust generation (containing TSP, $PM_{2.5}$ and PM_{10}). The transportation of ROM coal and overburden to the ROM tip area and overburden dump will be undertaken by 240 ton trucks which will utilise in pit haul roads. The use of the internal haul roads will be the highest dust generating source within the mine.

The crushing and temporary stockpiling of ROM coal at the ROM tip area will be a source of dust generation, particularly during the crushing activity. The stockpiling of overburden represents area sources that are amenable to wind erosion and subsequent deterioration of ambient air quality. All of the above activities will occur for the life of the project.

10.2.1.1.2 Management Objectives

The management objective is to ensure that dust emissions comply with regulatory standards for the protection of the environment and human health and well-being. The on-site and off-site airborne dust levels must comply with the relevant health protection criteria. The dust levels must not exceed the NDCR, 2013, non-residential rates on-site and the PM levels must not exceed the NAAQS limits.

10.2.1.1.3 Management Actions and Targets

Dust fallout monitoring must take place upwind and downwind of sensitive receptors and must not exceed the non-residential limit of 1 200 $mg/m^2/day$ at the mine boundary. Dust suppressants must be utilised on haul roads and exposed areas to limit dust generation. It is also recommended that PM_{10} monitoring be undertaken.

All monitoring results are to be maintained on a logging sheet for reference and proof of compliance to the air quality standards - PM_{10} (75 ug/m^3) and dust fallout (1 200 $mg/m^2/day$) at the mine boundary.

10.2.1.1.4 Impact Rating

The pre-mitigation and post mitigation impact ratings, as well as the mitigation measures to be implemented, are provided in Table 10-24.

Table 10-24: Pre-Mitigation and Post-Mitigation Potential Impact Ratings on Air Quality during the Operational Phase

Open Pit Mining			
Dimension	**Rating**	**Motivation**	**Significance**
Impact Description: Drilling and blasting activities associated with open pit mining may result in dust generation.			
Prior to mitigation/ management			
Duration	Project life (5)	Dust will be generated for the project life	Moderate (negative) - 78
Extent	Local (3)	Airborne dust may extend across the development site area.	
Intensity	Long-term (5)	Very serious environmental effect is anticipated as NAAQS and NDCR limits are exceeded at the mine boundary without the implementation of mitigation measures.	
Probability	Almost certain (6)	It is likely that impact will occur.	
Nature	Negative		
Mitigation/ Management actions			
▪ Limit blasting activities to days where the wind speed is less than 5.2 m per second; and ▪ Utilise wet drilling techniques.			
Post- mitigation			
Duration	Project life (5)	Dust will be generated duration of the operational phase	Minor (negative) - 66
Extent	Local (2)	Airborne dust may extend across the development site area.	
Intensity	Medium (4)	Medium term environmental impact	
Probability	Almost certain (6)	It is likely that impact will occur.	
Nature	Negative		
ROM Tip Area			
Dimension	**Rating**	**Motivation**	**Significance**
Impact Description: The crushing of ROM coal will be a source of dust generation.			
Prior to mitigation/ management			
Duration	Project life (5)	Dust will be generated for the duration of the project life	Minor (negative)

Extent	Local (3)	Airborne dust may extend across the development site area.	- 72
Intensity	Medium (4)	Medium term environmental effect is anticipated	
Probability	Almost certain (6)	It is likely that impact will occur.	
Nature	Negative		
Mitigation/ Management actions			
▪ Enclosure of the crusher to prevent dust dispersion; and ▪ Application of water sprays at the crushers to suppress dust generation.			
Post- mitigation			
Duration	Project life (5)	Dust will be generated duration of the project life	Minor (negative) - 45
Extent	Limited (2)	After mitigation measures are implemented, It is expected that dust impacts will be limited to the crushing site.	
Intensity	Minor (2)	Generated dust will have minor effect	
Probability	Likely (5)	Impacts may occur.	
Nature	Negative		
Haul and Access Road			
Dimension	**Rating**	**Motivation**	**Significance**
Impact Description: The transport of ROM coal and overburden, using in-pit haul roads, may result in dust generation.			
Prior to mitigation/ management			
Duration	Project life (5)	Dust will be generated for the project life	Moderate (negative) - 105
Extent	Region (5)	Airborne dust may extend across the region.	
Intensity	Long-term (5)	Very serious environmental effect is anticipated as NAAQS and NDCR limits are exceeded at the mine boundary without the implementation of mitigation measures.	
Probability	Certain (7)	Impact will definitely occur.	
Nature	Negative		
Mitigation/ Management actions			
▪ Dust suppressants and binders must be utilised on internal haul roads and exposed areas to reduce dust generation; and ▪ Speed limits must be enforced on site to limit dust generation.			
Post- mitigation			
Duration	Project life (5)	Dust will be generated duration of the operational phase	Minor (negative) - 45

Extent	Local (2)	Airborne dust may extend across the development site area.	
Intensity	Minor (2)	Generated dust will have minor effect	
Probability	Likely (5)	Impacts may occur.	
Nature	Negative		
Storage of Overburden			
Dimension	**Rating**	**Motivation**	**Significance**
Impact Description: The storage of overburden will be a source of fugitive dust emissions.			
Prior to mitigation/ management			
Duration	Project life (5)	Dust will be generated for the project life	Moderate (negative) - 84
Extent	Region (5)	Airborne dust may extend across the entire region	
Intensity	Medium-term (4)	Very serious environmental effect is anticipated as NAAQS and NDCR limits are exceeded at the mine boundary without the implementation of mitigation measures.	
Probability	Almost certain (6)	It is most likely that the impact would occur.	
Nature	Negative		
Mitigation/ Management actions			
▪ Dust suppressants and binders must be utilised on internal haul roads to reduce dust generation; and ▪ The overburden dump must be progressively vegetated and maintained to prevent erosion and dust generation.			
Post- mitigation			
Duration	Project life (5)	Dust will be generated duration of the operational phase	Minor (negative) - 36
Extent	Limited (2)	Limited to the site and its immediate surroundings	
Intensity	Minor (2)	Generated dust will have minor effect	
Probability	Probable (4)	Has occurred here or elsewhere and could therefore occur.	
Nature	Negative		

10.2.2 Soil, Land Use and Land Capability Impacts

No further impacts are anticipated to soil resources during the operational phase as the impact to soil resources would have occurred during site clearance and subsequent stockpiling. Although soils stockpiled in the topsoil berm may continue to be impacted upon, this impact is of the same nature as discussed in the construction phase. A Storm Water Management Plan will be implemented which will ensure that any dirty water from the operational areas does not report to the surrounding environment, which may contaminate surrounding soil resources should dirty water flow into the environment.

Regular maintenance and inspection of the topsoil berm must be undertaken to ensure that erosion does not occur and that vegetation is well established.

10.2.3 Fauna and Flora Impacts

The predominant impact to fauna and flora would have occurred during the construction phase as vegetation and available habitats will have been removed. The interactions and impacts on fauna and flora during the operational phase are provided in Table 10-25.

Table 10-25: Interactions and Impacts on Fauna and Flora during the Operational Phase

Interaction	Impact
Use of haul and access roads.	Alien invasive vegetation establishment and recruitment on disturbed areas.

10.2.3.1 Haul and Access Roads

10.2.3.1.1 Impact Description

The peripheries of roads are prone to the establishment of alien invasive vegetation within the disturbed areas; alien invasive vegetation will also contribute to the loss of indigenous vegetation and biodiversity. Vehicle movement may also result in accidents with faunal species.

10.2.3.1.2 Management Objectives

The objective is to minimise alien invasive vegetation establishment.

10.2.3.1.3 Management Actions and Targets

Alien invasive vegetation reduces biodiversity as it prevents and out-competes indigenous vegetation, as well as providing unsuitable habitats for faunal species. A target of 0 ha of alien invasive vegetation must be aimed for on all operational and disturbed areas.

10.2.3.1.4 Impact Ratings

The pre-mitigation and post mitigation impact ratings, as well as the mitigation measures to be implemented, are provided in Table 10-26.

Table 10-26: Pre-Mitigation and Post-Mitigation Potential Impact Ratings on Fauna and Flora during the Operational Phase

Haul and Access Roads			
Dimension	**Rating**	**Motivation**	**Significance**
Impact Description: The establishment of alien invasive vegetation on disturbed areas may reduce the biodiversity of the area.			
Prior to mitigation/ management			
Duration	Project life (5)	The impact will occur for the duration of the Project.	Moderate (negative) - 77
Extent	Limited (2)	The Project area and immediate surrounds will be impacted.	
Intensity	Medium (4)	Serious medium term environmental effect is anticipated	
Probability	Certain (7)	It is likely that impact will occur.	
Nature	Negative		
Mitigation/ Management actions			
▪ Develop and implement an Alien Invasive Management Plan.			
Post- mitigation			
Duration	Project life (5)	The impact will occur for the duration of the Project.	Minor (negative) - 45
Extent	Local (2)	The Project area and immediate surrounds will be impacted.	
Intensity	Medium (4)	Serious medium term environmental effect is anticipated	
Probability	Likely (5)	The impacts may occur	
Nature	Negative		

10.2.4 Aquatics Impacts

The interactions and impacts on aquatic ecology during the operational phase of the Kubu Coal Mine are provided in Table 10-27.

Table 10-27: Interactions and Impacts on Aquatic Ecology during the Operational Phase

Interaction	Impact
Development of ROM coal stockpile at the ROM tip area and overburden dump. Operation of the PCDs.	Runoff from the carboniferous ROM stockpile can negatively alter water chemistry significantly, with the overburden dump runoff also a source for potential water contamination.

Interaction	Impact
Development of open pit.	Runoff and seepage from the open pit activities can enter into the downstream meander arm. This may alter the local aquatic habitat and water quality.

10.2.4.1 ROM Tip Area, Overburden Dump, PCDs and Open Pit

10.2.4.1.1 Impact Description

Water runoff from the ROM tip area and overburden dump has the potential to impact on water resources if some of the runoff reports to the catchment. Water quality impacts for the proposed Project include increased dissolved or suspended solids and potential persistent pollutants, such as heavy metals and carboniferous materials. General water chemistry modification can occur as a result of increased metals (aluminium, manganese, cobalt and cadmium) and nutrients (sulphates, total nitrogen and phosphates) as well as modified pH balances, all of which can impact on aquatic ecology. Aquatic habitat quality impacts may include sedimentation, bed, channel and flow modification. All runoff from these areas will be considered dirty water and will be diverted to the PCDs and separated from clean water streams.

10.2.4.1.2 Management Objectives

The objective is to preserve, and in some cases improve, the PES of local river systems. This objective can be achieved through the management of potential water and habitat quality impacts.

10.2.4.1.3 Management Actions and Targets

The runoff and seepage of contaminated water from the ROM tip area, overburden dump and PCDs can cause aquatic state degradation. Runoff from these areas is unlikely to reach nearby streams or rivers however, due to the implementation of the storm water management structures. To prevent potential contamination, the use of cut-off drains, containment strategies and water balance (water management) is important. Management actions include:

- Diversion trench and berm systems, which diverts clean storm water around pollution sources and conveys and contains all dirty water to central pollution control impoundments;
- Liners for the PCDs including synthetic, clay and geological to prevent contaminated seepage and runoff from entering the local aquatic systems, as per the requirements of the applicable legislation;
- Where storm water enters or exits the Project area, sediment and debris trapping, as well as energy dissipation control measures must be put in place;
- Zero discharge of dirty/contaminated water; and

- The planting of indigenous vegetation around pollution control impoundments and structures should be completed as this has been shown to be effective in erosion and nutrient control.

To monitor the impacts of the proposed Project effectively, aquatic biomonitoring must take place bi-annually throughout the life of the Project. Techniques used in this study (Ecostatus determination) should be used and monitoring should be done once during the low flow (June and July) and once during the high flow (February and March). The primary target for management is to maintain the PES of the river systems. However, more specific targets are described below.

The monitoring for the presence of the fish species *Micralestes acutidens* and *Barbus trimaculatus* should be completed downstream of the activities. These species have been recorded in abundance in the section (SQR) of the Limpopo River. Although the species are relatively tolerant to poor water quality they are dependent on suitable aquatic habitat and therefore considered an indicator of good habitat. The monitoring programme should illustrate the presence or absence of these species. If the taxa are found to be absent, the study should assess the reasoning for this.

The SASS5, ASPT and MIRAI values should not reduce by more than 15% as a result of activities related to the proposed project. More specific taxa that should be monitored, as well as the implications of their presence/absence in the monitoring program are provided in Table 10-28.

Table 10-28: Monitoring Taxa, Threshold Diversity/Abundance and Relevance in Monitoring Program

Taxa	Diversity/Abundance	Relevance
Caenidae	Presence/A	Baseline maintenance
Baetidae	>2 species/B	Baseline maintenance
Libellulidae	Presence/A	Improved habitat

The pre-mitigation and post mitigation impact ratings, as well as the mitigation measures to be implemented, are provided in Table 10-9.

Table 10-29: Pre-Mitigation and Post-Mitigation Potential Impacts on Aquatics during the Operational Phase

Open Pit and PCDs			
Dimension	**Rating**	**Motivation**	**Significance**
Impact Description: Water and habitat quality modification due to siltation of surface water resources.			
Prior to mitigation/ management			
Duration	Project life (5)	The operation of the infrastructure will occur throughout the life of mine (20 years).	Minor (negative) - 66
Extent	Limited (2)	Due to the distance from river systems the extent is considered to be limited.	
Intensity	Serious impact (4)	Water and habitat quality deterioration will be expected to occur downstream of the various activities.	
Probability	Almost certain (6)	Pollution from the proposed activities is almost certainly going to occur as the activities, especially without mitigation.	
Nature	Negative		
Mitigation/ Management actions			
▪ Implement a Storm Water Management Plan; ▪ Water emanating from the dirty water areas must be collected via silt traps before entering the PCD. This water should be stored for re-use within the mine so as to prevent unnecessary discharge into the environment; ▪ All storm water management structures, including the PCDs, must be constructed in line with the various legislative requirements; ▪ Storm water management structures must be sized to accommodate the 1:50 year storm event (GN 704, 1999); and ▪ Surface water and groundwater quality monitoring must be undertaken.			
Post- mitigation			
Duration	Project life (5)	The operation of the infrastructure will occur throughout the life of mine.	Negligible (negative) - 27
Extent	Limited (2)	The mitigation measures will allow the impacts to be kept to a locally impacted extent.	
Intensity	Discernible change (2)	Impacts limited due to mitigation actions.	
Probability	Unlikely (3)	Probability reduced due to mitigation actions.	
Nature	Negative		
ROM Tip Area and Overburden Dump			
Dimension	**Rating**	**Motivation**	**Significance**
Impact Description: Water and habitat quality modification due to siltation of surface water resources.			
Prior to mitigation/ management			

Duration	Project life (5)	The operation of the ROM stockpile and overburden dump will occur throughout the life of mine.	Negligible (negative) - 18
Extent	Limited (2)	Due to the distance from river systems as well as the small footprint of the infrastructure the extent is considered to be limited.	
Intensity	Minor change (2)	Water and habitat quality deterioration will be expected to occur downstream of the various activities. However, due to the distance from river systems this is considered to be minor.	
Probability	Improbable (2)	Pollution from the proposed activities is most likely not going to occur as the activity will take place some distance from the river.	
Nature	Negative		
Mitigation/ Management actions			
▪ Implement a Storm Water Management Plan; ▪ The overburden dump and ROM tip area must be lined in accordance with the NEM:WA and other applicable legislation. Further waste classification must be undertaken to determine the liner requirements; and ▪ Surface water and groundwater quality monitoring must be undertaken.			
Post- mitigation			
Duration	Project life (5)	The operation of the ROM stockpile and overburden dump will occur throughout the life of mine.	Negligible (negative) - 9
Extent	Limited (2)	The mitigation measures will allow the impacts to be kept to a locally impacted extent.	
Intensity	Discernible change (2)	Impacts limited due to mitigation actions.	
Probability	Highly improbable (1)	Pollution from the proposed activities is most likely not going to occur as the activity will take place some distance from the river.	
Nature	Negative		

10.2.5 Wetlands Impacts

As discussed in Section 10.1.4.1.4, there are no anticipated impacts on wetland areas due to the implementation of the 100 m buffer zone. Specialist studies undertaken for the adjacent Boikarabelo Coal Mine have indicated that the wetlands are not recharged through groundwater resources; due to the proximity it is expected that the wetlands associated witht the Kubu Coal Mine are also surface water fed. However, there is the potential that surface, sub-surface and groundwater sources that feed the wetlands may be severed due to the establishment of the open pit and subsequent lowering of the water table due to dewatering activities. The potential for, and extent, of this impact will need to be verified through the development of a numerical model to determine the potential loss of water to the wetland and riparian areas. It must be noted

10.2.6 Surface Water Impacts

The interactions and impacts on surface water during the operational phase are provided in Table 10-30.

Table 10-30: Interactions and Impacts on Surface Water during the Operational Phase

Interaction	Impact
Runoff from the dirty water areas (overburden dumps and open pit)	Runoff reporting into the Limpopo River resulting in water contamination.
Development of dirty water areas	Reduction of Catchment Yield.

10.2.6.1 Storage of Overburden, ROM Tip Area, Open Pit and PCDs

10.2.6.1.1 Impact Description

Water will emanate from the overburden dump, ROM tip area and open pit; this water is considered as dirty water and has the potential to result in the sedimentation and contamination of surface water resources, such as the Limpopo River and its tributaries. Deteriorated water quality can impact on downstream water users.

Blasting activities releases ammonium nitrate from the explosive residue. This chemical has the potential to contaminate water resources, especially water located within the open pit. Should this water report to the catchment, surface water resources will be impacted upon through eutrophication of the water bodies. Dirty and clean water areas will be delineated and implemented on site to manage the water sources emanating from contamination sources.

10.2.6.1.2 Management Objectives

The management objective is to prevent the siltation and contamination of the surface water resources.

10.2.6.1.3 Management Actions and Targets

Monitoring of the surface water resources must continue to be undertaken to monitor potential impacts to water quality. Regular monitoring of the silt trap and storm water management structure must be undertaken; the silt traps and storm water management structures must be inspected after large storm events to ensure no blockages or breaches. Should blockages or breaches occur, immediate action must be undertaken to remove the debris or repair breached areas.

10.2.6.1.4 Impact Rating

The pre-mitigation and post mitigation impact ratings, as well as the mitigation measures to be implemented, are provided in Table 10-31.

Table 10-31: Pre-Mitigation and Post-Mitigation Potential Impacts on Surface Water during the Operational Phase

Open Pit, Storage of Overburden, ROM Tip Are and PCDs			
Dimension	**Rating**	**Motivation**	**Significance**
Impact Description: Sedimentation of surface water resources resulting in deteriorated water quality.			
Prior to mitigation/ management			
Duration	Project Life (5)	Impact can occur over the Project life if mitigation measures are not in place.	Minor (negative) - 65
Extent	Local (3)	Impact from contamination could be felt at local downstream users.	
Intensity	Moderately high (5)	The impact has moderately high negative and can be felt in a provincial/regional scale.	
Probability	Probable (5)	It is highly probable that the impact will occur if mitigation measures are not in place.	
Nature	Negative		
Mitigation/ Management actions			
▪ Implement a Storm Water Management Plan; ▪ Water emanating from the dirty water areas must be collected via silt traps before entering the PCD. This water should be stored for re-use within the mine so as to prevent unnecessary discharge into the environment; ▪ Should the contained water be more than the water use requirement within the mine, the Best Practice Guidelines (BPGs) advise that the water be recycled or as the last resort be treated to acceptable levels and discharged either to the natural environment or be supplied to other industries as a lower grade of water; ▪ Storm water management structures must be sized to accommodate the 1:50 year storm event (GN 704, 1999); and ▪ Water quality monitoring must be undertaken.			
Post- mitigation			
Duration	Medium term (5)	Impact can occur over the project life if mitigation measures are not in place.	Minor (negative) - 48
Extent	Local (3)	Impact from contamination could be felt at local downstream users.	
Intensity	Moderate (4)	The impact has moderately high negative and can be felt in a provincial/regional scale.	
Probability	Probable (4)	It is probable that the impact will occur if mitigation measures are in place.	
Nature	Negative		

10.2.6.2 PCDs

10.2.6.2.1 Impact Description

Containment of dirty water runoff from the within the dirty water demarcated area will reduce the amount of runoff reporting to the Limpopo River. A significant decrease in the catchment yield may have an impact on the downstream water users as there will be a reduction in water quantity, while also decreasing the flows required for the ecological reserve.

However, the infrastructure footprint area is approximately 5 km^2 and makes up less than 1% of total quaternary catchment of 816 km^2. The percentage decrease in MAR amounts to 0.61% for A41E quaternary catchment. Therefore, the loss in MAR for A41E quaternary catchment is considered to be to be a minor (negative). There are no mitigation measures for the reduction in catchment yield.

10.2.6.2.2 Impact Rating

The pre-mitigation and post mitigation impact ratings, as well as the mitigation measures to be implemented, are provided in Table 10-32.

Table 10-32: Pre-Mitigation and Post-Mitigation Potential Impacts on Surface Water during the Operational Phase

PCDs			
Dimension	**Rating**	**Motivation**	**Significance**
Impact Description: Reduction in the catchment yield due to the formation of dirty water areas and containment of dirty water within the PCDs.			
Prior to mitigation/ management			
Duration	Project life (5)	Loss of catchment yield will occur for the entire project life	Minor (negative) - 70
Extent	Local (3)	Will affect the contribution of water from the local catchment	
Intensity	Low (2)	May impact but very intensity	
Probability	Certain (7)	It is certain that dirty water runoff will be contained within the site, so this will result in a reduction of catchment yield	
Nature	Negative		
Mitigation/ Management actions			
There are no mitigation measures for the reduction in catchment yield.			

10.2.7 Groundwater Impacts

The operational phase will entail open pit mining and associated dewatering activities to ensure a safe mining environment, as well as the storage of overburden material at the overburden dump. The interactions and impacts are summarised in Table 10-33.

Table 10-33: Interactions and Impacts on Groundwater during the Operational Phase

Interaction	Impact
Storage of overburden material.	Groundwater quality will deteriorate due to poor quality seepage into the groundwater.
Dewatering and mining of the open pit.	Lowering of groundwater level in the vicinity of the mine and potential groundwater contamination.

10.2.7.1 Storage of Overburden and ROM Tip Area

10.2.7.1.1 Impact Description

ROM coal and overburden material will be stored within the ROM tip area and on the overburden dump, respectively. Runoff from the ROM stockpile and overburden dump may seep into the groundwater environment and potential impact water quality. ROM stockpiles and overburden dumps can release contaminants as rainfall infiltrating through can reach the groundwater with unacceptable water quality. Water quality in the Project area will slowly begin deteriorating which can be magnified with the oxidation of pyrite. The initial acidification of the infiltrating water will be neutralised by the natural buffering capacity in the overlying rock formations within the Project area.

A geochemical assessment to determine the potential for Acid Mine Drainage (AMD) was conducted for the Boikarabelo Coal Mine (Digby Wells, 2015) and concluded the following:

- The coal material has high pyrite content and smaller amounts of calcite and clay minerals. The pyrite content however increases the iron and sulphur in the coal resulting in AMD formation once oxidation takes place, and is classed as potentially acid generating with stockpiles potentially leading to AMD development and pollution of groundwater;
- The overburden samples are highly weathered material that will mostly be made up of topsoil with a high neutralising capacity. The overburden is classified as non-Potentially Acid Generating with a high buffering capacity;
- The highly weathered nature of the overburden shows low concentrations of metals and salt due to weathering over time removing most of the potential contaminants. However, arsenic leaches out above the recommended 0.01 mg/L value in one sample, with high concentrations of sulphate also leaching from the overburden samples; and
- The underburden has a higher tendency for acid generation and is classed as potentially acid generating.

The ROM coal will be temporarily stored prior to crushing and transport via overland conveyor to the adjacent Boikarabelo Coal Mine, which minimises the potential for AMD formation due to the limited storage time on site. The overburden material has been classified as non-potentially acid generating with a high buffering capacity, with the underburden having a higher tendency for acid generation.

10.2.7.1.2 Management Objectives

The management objectives are to prevent the generation and seepage of AMD into the groundwater resources.

10.2.7.1.3 Management Actions and Targets

Monthly water level and quarterly quality monitoring of the boreholes must be implemented.

The material at the ROM tip area should be stored for as short a time span possible to avoid oxidation of the material. The overburden dump and ROM tip area must be lined as per the requirements of the NEM:WA.

10.2.7.1.4 Impact Rating

The pre-mitigation and post mitigation impact ratings, as well as the mitigation measures to be implemented, are provided in Table 10-34.

Table 10-34: Pre-Mitigation and Post-Mitigation Potential Impacts on Groundwater during the Operational Phase

Storage of Overburden and ROM Tip Area			
Dimension	**Rating**	**Motivation**	**Significance**
Impact Description: Groundwater quality deterioration due to seepage of contaminants into the groundwater.			
Prior to mitigation/ management			
Duration	Long term (3)	Contamination is likely to happen over time due to exposure of waste material.	Minor (negative) - 55
Extent	Local (3)	The contamination plume might migrate to localised area.	
Intensity	High (5)	The contamination might have negative impacts on the groundwater.	
Probability	Likely (5)	There are high chances that contamination will occur.	
Nature	Negative		
Mitigation/ Management actions			
▪ Design and maintain the overburden dump to allow for maximum water runoff as opposed to infiltration into the dump; ▪ The overburden dump and ROM tip area must be lined in accordance with the NEM:WA and other applicable legislation. Further waste classification must be undertaken to determine the liner requirements; and ▪ Groundwater monitoring must be undertaken.			

Post- mitigation			
Duration	Project life (5)	Contamination plume is expected during the project life, if not mitigated.	Negligible (negative) - 21
Extent	Local (3)	The extent of the contamination will be localised.	
Intensity	Very serious (5)	The intensity is negative. It is difficult to rehabilitate groundwater contamination.	
Probability	Probable (4)	It is highly probable that contamination can occur.	
Nature	Negative		

10.2.7.2 Open Pit Mining

10.2.7.2.1 Impact Description

The development of the open pit will result in a change of topography, along with mine dewatering, and a cone of depression will form with a hydraulic gradient towards the open pit. Dewatering activities are essential to secure access to the open pit for machinery and to ensure the safety of workers. The groundwater flows will respond to the hydraulic gradient and the groundwater levels in the surrounding areas will be lowered. The lowering of the groundwater table in the surrounding areas of water supply or irrigation boreholes may lead to an increase in the pumping head and the potential for the drying up of boreholes, impacting groundwater users.

A numerical model was established for the adjacent Boikarabelo Coal Mine and was updated in November 2014. The numerical model was utilised to assess the potential impacts that the Kubu Coal Mine may have on the groundwater resources. The drawdown impact at the end of the life of mine due to the Kubu Coal Mine is provided in Plan 22, Appendix A. The maximum radius of impact is expected to be 2.8 km to the east; it is assumed that the Limpopo River will not be impacted based on the numerical model; however, boreholes in the vicinity of the Project area will experience a reduction in groundwater levels.

10.2.7.2.2 Management Objectives

The management objectives are to manage and monitor groundwater levels surrounding the mining operation.

10.2.7.2.3 Management Actions and Targets

The numerical model developed for the adjacent Boikarabelo Coal Mine was utilised to determine the potential drawdown impacts associated with the Kubu Coal Mine. A numerical model for Kubu Coal Mine must be developed prior to the establishment of the open pit to confirm potential impacts.

10.2.7.2.4 Impact Rating

The pre-mitigation and post mitigation impact ratings, as well as the mitigation measures to be implemented, are provided in Table 10-35.

Table 10-35: Pre-Mitigation and Post-Mitigation Potential Impact Ratings on Groundwater during the Operational Phase

Open Pit Mining			
Dimension	**Rating**	**Motivation**	**Significance**
Impact Description: The open pit mining and dewatering activities will result in a cone of depression and the groundwater levels will reduce in the vicinity of the Project. The Limpopo River is not expected to be impacted.			
Prior to mitigation/ management			
Duration	Project life (5)	Water level will decrease as cone of depression is created during mining operations.	Moderate (negative) - 77
Extent	Local (3)	The extent of the cone of depression is localised, but the more dewatering occurs the wider it extends.	
Intensity	Moderate (3)	The intensity is negative as it will affect neighbouring boreholes.	
Probability	Certain (7)	It is highly likely to occur as dewatering is done during mining.	
Nature	Negative		
Mitigation/ Management actions			
▪ A numerical model specific to Kubu Coal Mine must be developed and updated to confirm the potential impacts prior to mining; ▪ Groundwater levels must be monitored and data must be captured; and ▪ Dewatering rates must be recorded.			
Post- mitigation			
Duration	Project life (5)	The impact will occur for the duration of the Project.	Minor (negative) - 45
Extent	Local (2)	The Project area and immediate surrounds will be impacted.	
Intensity	Medium (4)	Serious medium term environmental effect is anticipated	
Probability	Likely (5)	The impacts may occur	
Nature	Negative		

10.2.8 Noise Impacts

Noise dispersion models were developed and indicated that the expected noise for the Project will not exceed the existing baseline noise levels at the surrounding suburban and rural receptors. Although certain noise sources may still be audible, there will be no disturbance and the impact is considered to be negligible. It must be noted that blast noise was not modelled due to its impulsive nature. The interactions and impacts associated with the operational phase are included in Table 10-36.

Table 10-36: Interactions and Impacts Associated with Noise during the Operational Phase

Interaction	Impact
Machinery, equipment and vehicles used during the operational phase.	Generation of noise.

10.2.8.1 ROM Tip Area, Haul and Access Roads and Open Pit Mining

10.2.8.1.1 Impact Description

Noise will emanate from machinery, equipment and vehicles operating during operational phase. The noise levels will not exceed the baseline noise levels and, thus, the significance of the impacts is considered to be negligible (negative).

Blasting is not assessed according the A-weighted pressure due to its impulsive nature as well as its higher decibel levels in the low frequency range. Noise dispersion modelling was therefore not performed for the blasting activities. Blasting is rather assessed according to its linear pressure (dBLin) instead of its A-weighted pressure (dBA) to establish the overpressure strength of the blast. The potential noise impacts associated with the blasting activities must be covered as part of the recommended blasting and vibration assessment to be undertaken.

10.2.8.1.2 Impact Rating

The pre-mitigation and post mitigation impact ratings, as well as the mitigation measures to be implemented, are provided in Table 10-37.

Table 10-37: Pre-Mitigation and Post-Mitigation Potential Impacts due to Noise during the Operational Phase

ROM Tip Area, Haul and Access Roads and Open Pit			
Dimension	**Rating**	**Motivation**	**Significance**
Impact Description: Noise will emanate from the machinery and vehicles.			
Prior to mitigation/ management			
Duration	Project Life (5)	Noise will be produced for the duration of life of mine	Negligible (negative) - 27
Extent	Local (3)	It is expected that during operation noise will extend as far as development site area.	
Intensity	Minor (1)	It is expected that during operational phase noise will have a minor social impact	
Probability	Unlikely (3)	It is unlikely that noise will impact on the surrounding communities.	
Nature	Negative		
Mitigation/ Management actions			
▪ Machinery, equipment and vehicles must be serviced to the designed requirements of the machinery/vehicles to ensure noise suppression mechanisms are effective e.g. installed exhaust mufflers; and ▪ Switching off equipment when not in use.			
Post- mitigation			
Duration	Project Life (5)	Noise will be produced for the duration of life of mine	Negligible (negative) - 18
Extent	Local (3)	It is expected that the disturbing noise will be limited to the site area.	
Intensity	Minimal (1)	It is expected that during operational phase noise will have a minor impact	
Probability	Unlikely (2)	It is unlikely that noise will impact on the surrounding receptors.	
Nature	Negative		

10.2.9 Socio-Economic Impacts

Majority of the potential socio-economic impacts associated with the Project may commence during the construction phase, or onset of the Project, and continue throughout the life of the Project. These impacts have been discussed as part of the construction phase in Section 10.1.9 and have been rated as such. The summary of the potential socio-economic impacts as a result of the operational phase of the Project is included in Table 10-38.

Table 10-38: Interactions and Impacts on the Socio-Economic Environment during the Operational Phase

Interaction	Impact
The operation of the Kubu Coal Mine and the employment of personnel during the operational phase.	Communities will have expectations for the project area which may result in community unrest towards the Project should expectations or commitments not be fulfilled. The implementation of the SLP commitments will have a positive impact on the surrounding communities however.
	There are potential health and safety impacts to surrounding communities due to the presence of the mining activities, as well as heavy vehicle movement in the area. In addition, due to the lack of available transport, employee fatigue may result, increasing the risk of health and safety impacts.
	Population influx may continue to occur throughout the operational phase. Population influx may result in the establishment and expansion of informal settlements, crime and community conflict.

10.2.9.1 Employment and Procurement

10.2.9.1.1 Impact Description: Local Development

Local communities will have employment expectations for the Kubu Coal Mine, however, the limited skills availability from the local communities will restrict and limit the employment opportunities available to the communities. This may result in the local communities' expectations not being met which may lead to community unrest and opposition against the mine and its employees. The implementation of the mitigation measures however, may result in a positive impact as expectations of the local communities are managed and training of community members will result in potential employment at Kubu Coal Mine or adjacent operations. The employment of local community members, either by Kubu Coal Mine or surrounding operations, will increase the local GDP, as well as improving the quality of life within the communities.

10.2.9.1.2 Management Objectives

The management objectives are to manage community expectations, as well as provide training and education to increase the skills development within communities, increasing the potential for employment.

10.2.9.1.3 Impact Rating

The summary of the potential socio-economic impacts of the Project is included in Table 10-39.

Table 10-39: Impacts on the Socio-economic Environment during the Operational Phase

Employment and Procurement			
Dimension	**Rating**	**Motivation**	**Significance**
Impact Description: Limited skills availability and unrealistic employment expectations may result in local community unrest against the Project, as well as limiting the availability of employment available to Kubu Coal Mine. The implementation of the mitigation measures will ensure that local employees are trained and have the appropriate skills for employment at the mine, which will increase the local GDP due to income generated.			
Prior to mitigation/ management			
Duration	Project life (5)	The impact will occur for the duration of the Project.	Moderate (negative) - 78
Extent	Local (3)	Local communities will be impacted.	
Intensity	High (5)	Serious medium term social unrest.	
Probability	Almost certain (6)	It is likely that impact will occur.	
Nature	Negative		
Mitigation/ Management actions			
▪ Implement career guidance within the core and affected communities identified through this study, to orientate school children with regards to which subjects are required to obtain mining technical or non-technical qualifications; and ▪ Implement education programmes regarding health and nutrition, as well as personal finance management to mention a few.			
Post- mitigation			
Duration	Project life (5)	The impact will occur for the duration of the Project.	Moderate (positive) 91
Extent	Local (3)	Local communities will be impacted.	
Intensity	High (5)	The impact will have a positive effect on local communities due to increase of GDP, as well as increased skills available to Kubu Coal Mine.	
Probability	Certain (7)	The impact will occur.	
Nature	Positive		

10.2.9.1.4 Impact Description: Health and Safety

The mining activities and the use of heavy vehicles and machinery may impact on local communities due to health and safety impacts. In addition, there is a lack of transport between the local communities and the Kubu Coal Mine, which may result in travel times of approximately 2 hours per day to report for work. The significant travel times are likely to result in employee fatigue which can have significant health impacts to the employee, impact on family and community life and the operational efficiency of the Kubu Coal Mine. The establishment of transport modes for employees from local communities will have a positive impact as employee fatigue will be reduced significantly.

10.2.9.1.5 Management Objectives

The objectives are to provide sufficient transport for local employees to reduce employee fatigue.

10.2.9.1.6 Impact Rating

The potential socio-economic impacts of the Project is included in Table 10-40.

Table 10-40: Impacts on the Socio-economic Environment during the Operational Phase

Employment and Procurement			
Dimension	**Rating**	**Motivation**	**Significance**
Impact Description: The lack of adequate transport from labour sending areas to the Kubu Coal Mine may cause labour fatigue, impacting on employees and their families, as well as operational efficiency within the mine.			
Prior to mitigation/ management			
Duration	Project life (5)	The impact will occur for the duration of the Project.	Moderate (negative) - 78
Extent	Local (3)	The workforce is likely to be from local communities.	
Intensity	High (5)	Employee fatigue will have impacts on the individual, families and mine output.	
Probability	Almost certain (6)	It is likely that impact will occur.	
Nature	Negative		
Mitigation/ Management actions			
▪ Provide adequate signage in the affected areas to warn communities of the health and safety risks of heavy vehicles and machinery and the mining operations; ▪ Circumvent fatigue due to long distances by predominantly recruiting from the local core and affected communities; ▪ Conduct a transportation study to carefully consider various transportation modes, routes and service providers; and ▪ Ensure that employees are orientated regarding transportation benefit and use thereof.			
Post- mitigation			
Duration	Project life (5)	The impact will occur for the duration of the Project.	Minor (positive) 65
Extent	Local (3)	The workforce is likely to be from local communities.	

Intensity	High (5)	The impact will have a positive effect on employees, their families and output at the mine as employee fatigue will be reduced.	
Probability	Likely (5)	The impact is likely to occur	
Nature	Positive		

10.2.9.1.7 Impact Description: Population Influx

Informal settlements may be expanded, or new informal settlements established by employees in an attempt to reduce travel distances to Kubu Coal Mine, or through the misuse of housing allowances as the allowanced may be spent elsewhere, as well as potential population influx by job seekers. The population influx and formation of informal settlements may result in related social impacts, such as crime, pressure on resources and services and health related issues. This impact is considered to be minor (negative); with the implementation of mitigation measures the impact can be considered minor (positive).

10.2.9.1.8 Management Objectives

The management objectives are to provide effective management and person financial management education to ensure that housing allowance are not misused, preventing the establishment of informal settlements.

10.2.9.1.9 Impact Rating

The potential socio-economic impacts of the Project is included in Table 10-41.

Table 10-41: Impacts on the Socio-economic Environment during the Operational Phase

Employment and Procurement			
Dimension	**Rating**	**Motivation**	**Significance**
Impact Description: Population influx, as well as misuse of housing allowances, may result in the formation of informal settlements which may result in associated impacts on resources, service delivery and health related issues.			
Prior to mitigation/ management			
Duration	Long term (4)	The impact will occur for the duration of the Project.	Minor (negative) - 66
Extent	Local (3)	The workforce is likely to be from local communities.	
Intensity	Medium (4)	The impact will have a positive effect on employees, their families and output at the mine as employee fatigue will be reduced.	
Probability	Highly probable (6)	The impact is likely to occur	
Nature	Negative		

Mitigation/ Management actions			
▪ Ensure effective expectation management of employees and communities in terms of housing expectations; ▪ Development of housing strategy upon the finalisation of all related decisions; ▪ Provide education regarding personal financial management; ▪ Ensure that employees are orientated regarding transportation benefit and use thereof; ▪ Ensure expectations within the communities and local SMMEs regarding local recruitment and local procurement, amongst other matters are managed effectively through continuous engagements; ▪ Ensure effective stakeholder management through various communication engagement mediums with stakeholders regarding the possible use of contractors, local recruitment plans, as well as preferential procurement initiatives; ▪ Implement contractor specifications to ensure that contractors are committed to the obligations of the mine with regards to local recruitment and procurement, as well as legislative and company specific obligations with regards to housing and living conditions; ▪ Constant monitoring of the region to prevent the establishment of informal settlements through partnership with the South African Police Services; and ▪ Establishing a grievance procedure to provide support to victims of social disarrays.			
Post- mitigation			
Duration	Long term (4)	The impact will occur for the duration of the Project.	Minor (positive) 66
Extent	Local (3)	The workforce is likely to be from local communities.	
Intensity	Medium (4)	The impact will have a positive effect on employees, their families and output at the mine as employee fatigue will be reduced.	
Probability	Highly probable (6)	The impact is likely to occur	
Nature	Positive		

10.2.10 Cultural Heritage Impacts

There are no anticipated impacts on heritage resources during the operational phase of the Project.

10.3 Decommissioning Phase

The decommissioning phase will entail the backfilling of the open pit with overburden material, the demolition of all infrastructure, dependant on the final land use of the site, and the rehabilitation of all disturbed areas. The rehabilitation activities will endeavour to restore the land to the pre-mining condition, or to a suitable end land use to be identified in a Closure Plan for the site. It must be noted, however, that there will be a final void remaining following rehabilitation, as detailed in the Rehabilitation Plan, Appendix M.

10.3.1 Air Quality Impacts

Demolition and rehabilitation activities will result in the handling of materials, soils and disturbance of the surface, all of which can contribute to the generation of dust. The interactions and impacts on air quality during the decommissioning phase are summarised in Table 10-42.

Table 10-42: Interactions and Impacts on Air Quality during the Operational Phase

Interaction	Impact
Dust emission from material handling and wind erosion.	Increased pollutant load in air resulting in reduced air quality.

10.3.1.1 Rehabilitation

10.3.1.1.1 Impact Description

The rehabilitation activities will utilise heavy vehicles and machinery similar to the construction phase of the Project. The handling of soil resources and movement of machinery on site will result in the generation of fugitive dust containing TSP, $PM_{2.5}$ and PM_{10}.

10.3.1.1.2 Impact Rating

The pre-mitigation and post mitigation impact ratings, as well as the mitigation measures to be implemented, are provided in Table 10-43.

Table 10-43: Pre-Mitigation and Post-Mitigation Potential Impacts on Air Quality during the Decommissioning Phase

Rehabilitation			
Dimension	**Rating**	**Motivation**	**Significance**
Impact Description: Rehabilitation activities will result in the generation of dust due to soil handling and exposure of soil surfaces.			
Prior to mitigation/ management			
Duration	Medium term (3)	Impact on air quality will be medium term for the duration of the rehabilitation	Minor (negative) - 42
Extent	Local (3)	Limited to the site and its immediate surroundings	
Intensity	Moderate short term (3)	Moderate impact is expected	
Probability	Likely (5)	Likely that dust will impact on the nearby receptors.	
Nature	Negative		
Mitigation/ Management actions			
▪ Application of dust suppressants on haul roads while in use prior to final rehabilitation; and ▪ Vegetation must be established on rehabilitated footprints and disturbed areas and monitored to ensure successful establishment.			

Post- mitigation			
Duration	Medium term (3)	Impact on air quality will be medium term for the duration of the rehabilitation	Negligible (negative) - 18
Extent	Limited (2)	Airborne dust will be limited to the development site area.	
Intensity	Minimal (1)	Minimal dust impact	
Probability	Unlikely (3)	Improbable that dust will impact nearby receptors.	
Nature	Negative		

10.3.2 Soil, Land Use and Land Capability Impacts

The major impacts to consider during the decommissioning and rehabilitation of the Project area will be the loss of topsoil as a resource through compaction and erosion. Whilst the decommissioning and removal of the infrastructure takes place, vehicles will drive on the soil surface, resulting in compaction. This reduces infiltration rates as well as the ability for plant roots to penetrate the compacted soil. This in turn reduces vegetative cover and increases runoff potential which leads to increased erosion hazards.

During the decommissioning phase, the open pit and project area will be rehabilitated as per the Rehabilitation Plan (Appendix M).

The interactions and impacts associated with soil resources during the decommissioning phase are outlined in Table 10-44.

Table 10-44: Interactions and Impacts on Soil Resources during the Decommissioning Phase

Interaction	Impact
Heavy vehicles and machinery will be utilised as part of the demolition of infrastructure.	Loss of topsoil as a resource – Erosion and Compaction
Rehabilitation of the Project area will be undertaken. Rehabilitation activities will cover the extent of the infrastructure footprint areas and will include the ripping of the compacted soil surfaces, spreading of topsoil and establishment of vegetation.	Loss of topsoil as a resource – Erosion and Compaction

10.3.2.1 Infrastructure Area, Haul and Access Roads and Rehabilitation

10.3.2.1.1 Impact Description

Heavy vehicles and machinery used during the demolition of infrastructure, as well as rehabilitation activities, can result in the compaction of soil surfaces which increases surface water runoff, prevents vegetation establishment and results in soil erosion. The rehabilitation activities will also involve the handling of soil resources, which may result in soil erosion. The loss of topsoil is a serious impact as the natural regeneration of topsoil takes hundreds of years.

10.3.2.1.2 Management Objectives

The management objectives are to prevent and avoid soil compaction and erosion and enhance the success of the rehabilitation activities. The rehabilitated areas need to be monitored for erosion and, should erosion occur, corrective actions must be taken to limit and reduce the impact from spreading.

Bare areas need to be assessed for compaction or contamination and ripped if required and reseeded. After the infrastructure has been removed and rehabilitated, the areas must be assessed for compaction and possible erosion risk areas and corrected or protected immediately.

10.3.2.1.3 Impact Rating

The pre-mitigation and post mitigation impact ratings, as well as the mitigation measures to be implemented, are provided in Table 10-4.

Table 10-45: Pre-Mitigation and Post-Mitigation Potential Impacts on Soils during the Decommissioning Phase

Infrastructure Area, Haul and Access Roads and Rehabilitation			
Dimension	**Rating**	**Motivation**	**Significance**
Impact Description: The loss of topsoil as a resource due to compactions and erosion.			
Prior to mitigation/ management			
Duration	Project Life (6)	When the soil has eroded the impact will be permanent and is potentially irreversible even with management.	Minor (negative) - 39
Extent	Limited (2)	Compaction and erosion will occur on a limited scale and in the unmitigated situation the erosion will extend beyond the direct infrastructure.	
Intensity	Very Serious (5)	Loss of topsoil may result in loss of land capability and land use. Soil regeneration takes a very long time.	
Probability	Unlikely (3)	Vehicles will remain on existing access routes	
Nature	Negative		
Mitigation/ Management actions			
▪ The Project area must be rehabilitated according to the guidelines provided in the Rehabilitation Plan (Appendix M).			

Post- mitigation			
Duration	Short term (2)	If the mitigation measures are implemented the impact will be for less than a year.	Negligible (negative) - 12
Extent	Very limited (1)	Compaction and erosion will occur on a very limited scale.	
Intensity	Moderate (3)	The intensity of the impact will be reduced if mitigation is implemented.	
Probability	Rare (2)	If mitigation is followed the impact will rarely occur	
Nature	Negative		

10.3.3 Fauna and Flora Impacts

The decommissioning phase will entail the rehabilitation of the Project area and will aim to restore the land to the pre-mining environment, or to a suitable end land use to be identified in a Closure Plan for the site. The interactions and impacts on fauna and flora during the decommissioning phase are provided in Table 10-46.

Table 10-46: Interactions and Impacts on Fauna and Flora during the Decommissioning Phase

Interaction	Impact
Rehabilitation of the Project site.	Restoration of the environment to emulate pre-mining conditions.
	Alien invasive vegetation establishment.

10.3.3.1 Rehabilitation

10.3.3.1.1 Impact Description

The rehabilitation of the open pit and infrastructure areas will include the back-filling of the final void, shaping of the topography and establishment of vegetation. The purpose of the rehabilitation is to attempt to return the area to as close as possible to the pre-mining environment or ecologically functional state. Although this is a positive activity, the environment is unlikely to be returned to the pre-mining environment and the end state of the Project area will still be considered as a negative impact in comparison to the baseline environment; this activity can be considered as a neutral impact should rehabilitation be successful.

10.3.3.1.2 Management Objectives

The objectives of rehabilitation will be to establish indigenous vegetation within disturbed footprint areas and to prevent the establishment of alien invasive vegetation. The rehabilitation will attempt to re-instate the pre-mining landscape.

10.3.3.1.3 Management Actions and Targets

Alien invasive vegetation reduces biodiversity as it prevents and out-competes indigenous vegetation, as well as providing unsuitable habitats for faunal species. A target of 0 ha of alien invasive vegetation must be aimed for on all operational and disturbed areas. Indigenous vegetation and SSC, such as *A. erioloba* and *C.imberbe,* must be established on site and relocated from the established nursery.

10.3.3.1.4 Impact Ratings

The pre-mitigation and post mitigation impact ratings, as well as the mitigation measures to be implemented, are provided in Table 10-47.

Table 10-47: Pre-Mitigation and Post-Mitigation Potential Impact Ratings on Fauna and Flora during the Decommissioning Phase

Rehabilitation			
Dimension	**Rating**	**Motivation**	**Significance**
Impact Description: The significance of the impact to fauna and flora as experienced in the construction phase will continue until rehabilitation activities are undertaken.			
Prior to mitigation/ management			
Duration	Beyond project life (6)	The loss of vegetation and habitats will occur beyond the operational phase of the Project.	Moderate (negative) - 91
Extent	Limited (2)	Vegetation and habitat loss will be limited to the Project area.	
Intensity	Long-term (5)	Red Data and Protected species may be destroyed.	
Probability	Certain (7)	Site clearing will occur, removing vegetation.	
Nature	Negative		
Mitigation/ Management actions			
▪ Rehabilitation must be undertaken according to the Rehabilitation Plan; ▪ An Alien Invasive Management Plan must be developed and implemented; ▪ Temporary berms must be constructed until vegetation is established to intercept any eroded material; ▪ *A. erioloba* and *C.imberbe* must be established on site, relocated from the nursery established during the Project; and ▪ Vegetation establishment must be monitored.			
Post- mitigation			
The rehabilitation activities are regarded as a positive activity but with a neutral impact as the rehabilitation will aim to emulate and restore the pre-mining environment.			

10.3.4 Aquatics Impacts

The potential impacts associated with the decommissioning phase are similar to that of the construction phase as infrastructure will be demolished, the open pit backfilled and all areas rehabilitated. The rehabilitation involves the handling of soils and the use of machinery and vehicles, all of which can result in the susceptibility of soil erosion and subsequent impact on water quality and aquatic ecology. The interactions and impacts on aquatic ecology are provided in Table 10-48.

Table 10-48: Interactions and Impacts on Aquatic Ecology during the Decommissioning Phase

Interaction	Impact
Rehabilitation activities of the Project area.	Increased runoff due to vegetation clearing can result in instream and riparian habitat modification or destruction through erosion, flow, bed, channel and water quality modification. Water quality deterioration is related to an increase in the amount of suspended/dissolved solids which results in increased sedimentation and changes to the physical chemistry of the water in downstream regions. These physical impacts could lead to reduced aquatic biodiversity. Increased runoff chemicals used in the construction activities have the potential to contaminate downstream aquatic ecosystems

10.3.4.1 Rehabilitation

10.3.4.1.1 Impact Description

Rehabilitation activities will utilise machinery and vehicles which can compact soils. Rehabilitation activities will also include the grading and levelling of the Project area and distribution of topsoil, all of which leaves soils susceptible to erosion which can flow into water resources as part of surface runoff. Water quality impacts for the proposed Project include increased dissolved or suspended solids and potential persistent pollutants. In addition, general water chemistry modification can occur as a result of increased metals (aluminium, manganese, cobalt and cadmium) and nutrients (sulphates, total nitrogen and phosphates) as well as modified pH balances, all of which can impact on aquatic ecology. Aquatic habitat quality impacts may include sedimentation, bed, channel and flow modification.

10.3.4.1.2 Management Objectives

The objective is to preserve, and in some cases improve, the PES of local river systems. This objective can be achieved through the management of potential water and habitat quality impacts.

10.3.4.1.3 Management Actions and Targets

To monitor the impacts of the proposed Project effectively, aquatic biomonitoring must take place bi-annually throughout the life of the Project. Techniques used in this study (Ecostatus determination) should be used and monitoring should be done once during the low flow (June and July) and once during the high flow (February and March). The primary target for management is to maintain the PES of the river systems. However, more specific targets are described below.

The monitoring for the presence of the fish species *Micralestes acutidens* and *Barbus trimaculatus* should be completed downstream of the activities. These species have been recorded in abundance in the section (SQR) of the Limpopo River. Although the species are relatively tolerant to poor water quality they are dependent on suitable aquatic habitat and therefore considered an indicator of good habitat. The monitoring programme should illustrate the presence or absence of these species. If the taxa are found to be absent, the study should assess the reasoning for this.

The SASS5, ASPT and MIRAI values should not reduce by more than 15% as a result of activities related to the proposed project. More specific taxa that should be monitored, as well as the implications of their presence/absence in the monitoring program are provided in the table below (Table 10-8).

10.3.4.1.4 Impact Rating

The pre-mitigation and post mitigation impact ratings, as well as the mitigation measures to be implemented, are provided in Table 10-49.

Table 10-49: Pre-Mitigation and Post-Mitigation Potential Impacts on Aquatics during the Decommissioning Phase

Rehabilitation			
Dimension	**Rating**	**Motivation**	**Significance**
Impact Description: Water and habitat quality modification due to siltation of surface water resources.			
Prior to mitigation/ management			
Duration	Medium term (3)	The rehabilitation of the Project area will occur as short term.	Minor (negative) - 54
Extent	Local (3)	Runoff during the rehabilitation of the open pit will contain sediments and therefore result in water and habitat quality impacts downstream in a local area.	
Intensity	Moderate impacts (3)	Runoff during the rehabilitation of the open pit and topsoil berm will contain sediments and therefore result in water and habitat quality impacts downstream.	

Probability	Almost certain (6)	Pollution from the proposed activities is almost certainly going to occur as the activities, especially without mitigation.	
Nature	Negative		
Mitigation/ Management actions			
▪ Establish silt traps within clean water channels; ▪ Limit vehicle and equipment use to the disturbed footprint areas; ▪ Establish and monitor vegetation on the Project area, as per the Rehabilitation Plan; ▪ Soils adjacent to the wetlands that have been compacted must be loosened to allow for germination of vegetation; and ▪ Temporary diversion trenches and berms must be constructed to convey runoff to temporary trenches.			
Post- mitigation			
Duration	Medium term (3)	The rehabilitation of the Project area will occur as short term.	Negligible (negative) - 21
Extent	Limited (2)	The mitigation measures will allow the impacts to be kept to a locally impacted extent.	
Intensity	Discernible change (2)	Impacts limited due to mitigation actions.	
Probability	Unlikely (3)	Probability reduced due to mitigation actions.	
Nature	Negative		

10.3.5 Wetlands Impacts

There are no anticipated impacts on wetlands during the decommissioning phase.

10.3.6 Surface Water Impacts

The decommissioning phase will include the demolition and rehabilitation activities. The potential impacts to surface water during the decommissioning phase are similar to the potential impacts that may arise during the construction phase. The interactions and impacts on surface water during the decommissioning phase are provided in Table 10-50.

Table 10-50: Interactions and Impacts on Surface Water during the Decommissioning Phase

Interaction	Impact
Exposure of soils after with the removal of infrastructure	Siltation of surface water resources leading to deteriorated water quality.

10.3.6.1 Rehabilitation

10.3.6.1.1 Impact Description

Removal of infrastructure will expose the soil surfaces and leave it prone to erosion resulting in potential siltation of the natural water resources (Limpopo River) when runoff reports to the rivers. This will deteriorate the water quality and hence impact the downstream water users, as well as the aquatic life.

This impact is considered to be minor (negative) and the significance can be reduced by implementing the following mitigation measures:

- Rehabilitation must be undertaken according to the Rehabilitation Plan;
- Temporary berms must be constructed until vegetation is established to intercept any eroded material;
- Vegetation establishment must be monitored; and
- Water quality monitoring must be undertaken

10.3.6.1.2 Management Objectives

The management objective is to prevent the siltation and subsequent deterioration of quality in the surface water resources.

10.3.6.1.3 Management Actions and Targets

Monitoring of the surface water resources must continue to be undertaken to monitor potential impacts to water quality. TDS concentrations for the monitoring locations are already considered to be high and further impacts to the surface water must be avoided.

10.3.6.1.4 Impact Rating

The pre-mitigation and post mitigation impact ratings, as well as the mitigation measures to be implemented, are provided in Table 10-51.

Table 10-51: Pre-Mitigation and Post-Mitigation Potential Impacts on Surface Water during the Decommissioning Phase

Rehabilitation			
Dimension	**Rating**	**Motivation**	**Significance**
Impact Description: Sedimentation of surface water resources resulting in deteriorated water quality.			
Prior to mitigation/ management			
Duration	Medium term (3)	The impact will occur equal to the duration of the decommissioning phase	Minor (negative) - 70
Extent	Local (3)	The impacts will be localized to the nearby water resources from where the silt is being generated and the immediate downstream	
Intensity	Moderately high (4)	This will have moderate impacts resulting in a, limited ecosystem functionality for downstream users	
Probability	Certain (7)	Without appropriate mitigation, there will definitely be significant erosion	

Nature	Negative		
Mitigation/ Management actions			
▪ Rehabilitation must be undertaken according to the Rehabilitation Plan; ▪ Temporary berms must be constructed until vegetation is established to intercept any eroded material; ▪ Vegetation establishment must be monitored; and ▪ Water quality monitoring must be undertaken.			
Post- mitigation			
Duration	Medium term (3)	The impact will occur equal to the duration of the decommissioning phase	Minor (negative) - 36
Extent	Local (3)	The impacts will be localized to the nearby water resources from where the silt is being generated and the immediate downstream	
Intensity	Moderate (3)	Mitigation will reduce the impacts	
Probability	Probable (4)	Mitigation will reduce the erosion and thus siltation sources probability significantly	
Nature	Negative		

10.3.7 Groundwater Impacts

The open pit will be backfilled and rehabilitated during the decommissioning phase. Table 10-52 details the Project activities' interactions and the resultant impacts on groundwater resources.

Table 10-52: Interactions and Impacts on Groundwater during the Decommissioning Phase

Interaction	Impact
Backfilling of open pit	Contamination of groundwater

10.3.7.1 Rehabilitation

10.3.7.1.1 Impact Description

The decommissioning phase is characterised by the cessation of the mining activities and dewatering programmes. The open pit void will be backfilled using overburden material from the overburden dump. The backfilling of open pit with overburden material could have a negative impact as the in-pit storage of the overburden material can contaminate the groundwater below and around the void. As water seeps through the backfill material, sulphates and metals could potentially dissolve and infiltrate the groundwater zone. As discussed in Section 10.2.7.2, the overburden material was classified as non-potentially acid generating, although some samples indicated high sulphates and arsenic levels which can impact water quality. This impact is considered as minor (negative) and groundwater monitoring must continue post closure to identify any potential groundwater contamination.

10.3.7.1.2 Management Objectives

The management objectives are to successfully backfill and rehabilitate the open pit to prevent potential future groundwater contamination.

10.3.7.1.3 Management Actions and Targets

Groundwater monitoring must continue post closure to ensure that groundwater contamination does not occur.

10.3.7.1.4 Impact Rating

The pre-mitigation and post mitigation impact ratings, as well as the mitigation measures to be implemented, are provided in Table 10-53.

Table 10-53: Pre-Mitigation and Post-Mitigation Potential Impacts on Groundwater during the Decommissioning Phase

Rehabilitation			
Dimension	**Rating**	**Motivation**	**Significance**
Impact Description: Groundwater quality contamination.			
Prior to mitigation/ management			
Duration	Beyond Project life (6)	Backfilling could have a significant environmental disadvantage since the in-pit storage of discards can contaminate the groundwater below and around the void.	Minor (negative) - 70
Extent	Local (3)	The extent of the contamination is localised, but the contamination might move towards the river.	
Intensity	Major (5)	The intensity is negative as water seeps through the backfill material, sulphates and metals could potentially dissolve and infiltrate the groundwater zone	
Probability	Likely (5)	It is highly likely that contamination by minerals leached into the groundwater will occur.	
Nature	Negative		
Mitigation/ Management actions			
▪ Water quality monitoring must be undertaken.			
Post- mitigation			
Duration	Long term (4)	Once the backfilling commences the monitoring plan should be carried out beyond the Project life.	Minor (negative) - 55

Extent	Local (3)	The extent will be localised. As groundwater will flow towards the pit, the contamination will not migrate away.	
Intensity	Minor (4)	The intensity will be high as groundwater is difficult to clean once is contaminated.	
Probability	Likely (5)	It is likely the contamination will happen but the plume will not migrate away from the pit.	
Nature	Negative		

10.3.8 Noise Impacts

Table 10-54 details the Project activities' interactions and the resultant impacts due to the generation of noise as a result of the proposed developments. Decommissioning activities will be similar to the impacts associated with the construction phase, although the decommissioning phase will be less machine and vehicle intensive than during construction phase.

Table 10-54: Interactions and Impacts Associated with Noise during the Decommissioning Phase

Interaction	Impact
Machinery, equipment and vehicles used during demolition of infrastructure and rehabilitation	Generation of noise.

10.3.8.1 Infrastructure Area and Rehabilitation

10.3.8.1.1 Impact Description

Noise will emanate from machinery, equipment and vehicles operating during the site demolition and rehabilitation activities. The noise levels will not exceed the baseline noise levels.

10.3.8.1.2 Impact Rating

The pre-mitigation and post mitigation impact ratings, as well as the mitigation measures to be implemented, are provided in Table 10-55.

Table 10-55: Pre-Mitigation and Post-Mitigation Potential Impacts due to Noise during the Decommissioning Phase

Rehabilitation and Infrastructure Area			
Dimension	**Rating**	**Motivation**	**Significance**
Impact Description: Noise will emanate from the machinery and vehicles.			
Prior to mitigation/ management			
Duration	Short term (2)	Noise will be produced for the duration of the decommissioning phase	Negligible (negative) - 18
Extent	Local (3)	It is expected that during decommissioning noise will extend as far as development site area.	
Intensity	Minimal (1)	It is expected that during decommissioning noise will have a minimal impact	
Probability	Unlikely (3)	It is unlikely that noise will impact on the surrounding receptors.	
Nature	Negative		
Mitigation/ Management actions			
▪ Restricting demolition and rehabilitation activities to daylight hours; ▪ Machinery, equipment and vehicles must be serviced to the designed requirements of the machinery/vehicles to ensure noise suppression mechanisms are effective e.g. installed exhaust mufflers; and ▪ Switching off equipment when not in use.			
Post- mitigation			
Duration	Short term (2)	Noise will be produced for the duration of the decommissioning phase	Negligible (negative) - 12
Extent	Local (3)	It is expected that during decommissioning noise will be limited to site if mitigation measures are implemented.	
Intensity	Minimal (1)	It is expected that during decommissioning noise will have a minimal social impact	
Probability	Rare (2)	It is improbable that noise will impact on the surrounding receptors.	
Nature	Negative		

10.3.9 Socio-Economic Impacts

The summary of the potential socio-economic impacts as a result of the decommissioning phase of the Project is included in Table 10-56.

Table 10-56: Interactions and Impacts on the Socio-Economic Environment during the Decommissioning Phase

Interaction	Impact
Decommissioning of Kubu Coal Mine.	Dependency on the mine for sustaining the local economy

10.3.9.1 Employment and Procurement

10.3.9.1.1 Impact Description: Dependency on Mine

While mining has contributed significantly to economic development in the LLM, this also has a negative component in that mining is not a permanent activity. Mine closure could, therefore, have significant negative consequences for areas and local economies that have not invested in economic diversification. The loss of jobs and ceasing of procurement will result in the closing down of businesses and a decrease in local investment and spending resulting in an overall economic slow-down.

10.3.9.1.2 Management Objectives

The MPRDA requires that the mine's SLP provide strategies and measures that could prevent job loss in the event of circumstances threatening guaranteed employment. In the event of retrenchments becoming unavoidable as a result of downscaling or closure, alternatives to save jobs/avoid downscaling should be investigated beforehand. In accordance with legislative requirements, a Closure Plan (which will include distinct socio-economic measures), will be developed well in advance of planned mine closure and will include a socio-economic impact assessment and stakeholder consultation process. The Closure Plan will be reviewed every five years starting 15 years before mine closure.

10.3.9.1.3 Impact Rating

The summary of the potential socio-economic impacts of the Project is included in Table 10-57.

Table 10-57: Impacts on the Socio-economic Environment during the Decommissioning Phase

Employment and Procurement			
Dimension	**Rating**	**Motivation**	**Significance**
Impact Description: Mine closure and decommissioning will have a direct socio-economic impact on mine employees, as well as a multiplier impact on the region due to dependency of the economy on mining.			
Prior to mitigation/ management			
Duration	Beyond Project Life (6)	Effects of retrenchments and decommissioning will be long lasting.	Minor (negative)

Extent	Local (3)	Service providers from the local municipal area, as well as all employees, will be most severely affected.	- 52
Intensity	Moderate (4)	Local economy may become increasingly dependant	
Probability	Probable (4)	The decommissioning of the Project will likely have significant impacts on the local economy due to the dependency on mining.	
Nature	Negative		
Mitigation/ Management actions			
▪ Collaborate with other industries to support the diversification of the local economy; ▪ Implement the requirements of the SLP and develop a Closure Plan prior to closure; ▪ Provide referral letters to all employees; ▪ Provide certificates of completion for all training courses, informal and formal, undertaken; and ▪ Collaborate with the relevant government departments to manage decommissioning jointly.			
Post- mitigation			
Duration	Beyond Project Life (6)	Effects of retrenchments and decommissioning will be long lasting.	Minor (negative) - 48
Extent	Local (3)	Service providers from the local municipal area, as well as all employees, will be most severely affected.	
Intensity	Moderate (3)	Local economy may become increasingly dependant	
Probability	Probable (4)	The decommissioning of the Project will likely have significant impacts on the local economy due to the dependency on mining.	
Nature	Negative		

10.4 Cumulative Impacts

Cumulative impacts are defined as impacts arising from the combined effects of two or more projects or actions. The importance of identifying and assessing cumulative impacts is that the whole is often greater than the sum of its parts, implying that the total effect of multiple stressors or change processes acting simultaneously on a system may be greater than the sum of their effects when acting in isolation. Cumulative impacts usually relate to large-scale rather than site-specific impacts and have a tendency to increase the intensity of impacts already predicted for the proposed project.

Potential cumulative impacts may result due to the current and proposed land uses for the region. The proposed Boikarabelo Coal Mine is located to the southwest of the Kubu Coal Mine and will commence with mining activities once a WULA has been granted. In addition, there are numerous prospecting activities and MRAs being undertaken in the region which all fall within the Potential Development Area 1 of the Waterberg SDF. Should all the proposed mines become operational, this may have significant contributions to the cumulative impacts on the region. Furthermore, the Matimba Power Station and Medupi

Power Station are located in Lephalale which may have significant impacts to the regions water resources and air quality.

The potential cumulative impacts as a result of the Kubu Coal Mine Project are discussed in Table 10-58.

Table 10-58: Potential Cumulative Impacts

Environmental Aspect	Cumulative Impacts
Air Quality	The existing dust fallout rates for the Project area were predominantly within the residential NDCR limits of 600 mg/m^2/day. Dispersion modelling indicated that the dust deposition and PM concentrations at nearest sensitive receptors were within the respective limits. The operational phase of the Kubu Coal Mine will result in localised impacts. However, with the recommended mitigation measures in place, the potential impacts might be reduced to within regulatory requirements. It is not envisaged that the proposed project will exacerbate the current ambient air quality scenario in the area.
Soils	The major impact associated with mining is the disturbance of natural occurring soil profiles consisting of layers or soil horizons. Rehabilitation of disturbed areas aims to restore land capability but the South African experience is that post mining land capability usually decreases compared to pre-mining land capability. Soil formation is determined by a combination of five interacting main soil formation factors. These factors are time, climate, slope, organisms and parent material. Soil formation is an extremely slow process and soil can therefore be considered as a non-renewable resource. Soil quality deteriorates during stockpiling and replacement of these soil materials into soil profiles during rehabilitation cannot imitate pre-mining soil quality properties. Depth however can be imitated but the combined soil quality deterioration and resultant compaction by the machines used in rehabilitation, leads to a net loss of land capability. A change in land capability then forces a change in land use. The impact on soil is high because natural soil layers are stripped and stockpiled for later use in rehabilitation. In addition, soil fertility is impacted because stripped soil layers are usually thicker than the defined topsoil layer. The topsoil layer is the layer where most plant roots are found and is generally 0.3 m thick.
Fauna and Flora	The Project area falls within the Limpopo Sweet Bushveld vegetation unit; this unit requires a specific balance between the taller plants (trees and shrubs) and the grass layer. Under natural conditions this balance is achieved through ecosystems processes which include grazers, predators, rain and temperature amongst others. The current impacts within the study area are the establishment of alien invasive vegetation and overgrazing. These impacts can be attributed to the current land use of game

Environmental Aspect	Cumulative Impacts
	farming within the area. The effects of overgrazing and establishment of alien invasive vegetation could lead to bush encroachment and loss of biodiversity which could then lead to erosion within the Project area. Surrounding land uses include open pit mining and game farming which have further decreased the biodiversity in the local area. The development of the Kubu Coal Mine may have an impact on the already declining populations of *A. erioloba* and *B albutrunca*. It is therefore necessary that conservation areas be established for Red Data and protected plant and animal species. Furthermore, the conservation of the natural vegetation and habitat is vital to the region as more mining operations are currently expected to commence. The development of power stations and mines places pressure on the regional vegetation and forces faunal species to migrate out of the region; and as the Project area is close to the South Africa – Botswana border, many faunal species may migrate out of South Africa.
Aquatics	The PES of the rivers associated with the proposed Project is currently moderately modified with biota sensitive to habitat modification. Considering the proposed Project and its distance from the meander arm as well as the Limpopo River, large effects to habitat and water quality are not anticipated. However, the importance of the topsoil berm is highlighted as contamination of the water quality in the downstream regions will have significant impacts should dirty water not be contained.
Surface Water	The project infrastructure falls within quaternary catchments A41E and water runoff draining from the Project area will eventually report to the Limpopo River. The overall current water quality status indicated contamination of particular constituents, such as chloride, TDS, EC, magnesium, sodium and pH. These parameters exceeded the maximum allowable limits when compared against the South African Water Quality Guidelines for Agriculture (Irrigation) and the SANS 241:2011 limits. The Limpopo River is the only perennial river associated with this quaternary catchment and it marks the boundary between South Africa and Botswana. There are several rivers upstream of the project area that feed into the Limpopo River from South Africa and Botswana side. The closest upstream tributaries include Matlabas and Bonwapitse from the South African and Botswanan sides, respectively. It is also important to note that a number of surface water uses upstream of the Project area exist, including irrigation, mining, domestic uses and livestock watering. These existing activities/ land uses could potentially impact the surface water quality. The proposed Kubu Coal mine could potentially increase the impacts on the Limpopo River should soils erode into the river as a

Environmental Aspect	Cumulative Impacts
	result of site clearance, as well as runoff from contaminated areas within the Project area. This could mobilise dissolved metals such as iron and manganese. However, this could greatly be prevented by implementing the recommended mitigation measures presented in this report. This will prevent further deterioration of water quality in the Limpopo River.
Groundwater	Groundwater availability is a problem in the central and western parts of the Waterberg Coalfield and the natural recharge rate is very low (0.75% of MAP). Care should be taken not to over abstract the local aquifers during dewatering as this might have a negative impact on local private groundwater users and base flow to the rivers and streams in the area. The A41E quaternary catchment hosts most of the current coal exploration and coal mining activities within the Waterberg Coalfield and includes the Boikarabelo Coal Mine. The eastern boundary of this catchment extends to within 5 km of the Grootegeluk Coal Mine (Plan 2, Appendix A). Groundwater is a very valuable and limited resource in this area and it has to be managed and protected to ensure a sustainable resource for all users and the local communities and farming sector. The potential cumulative impacts include: ■ Decrease in the local groundwater level and possible drying up of shallow private boreholes; ■ Deterioration of the current groundwater quality; ■ An increase in AMD; and ■ Impacting the flow (water availability) and water quality of the Limpopo River. A scenario was run with the numerical model to simulate the cumulative impact of mining the Boikarabelo Coal Mine and Kubu Coal Mine simultaneously (Plan 23, Appendix A). During operation, the water level at the pits will be lowered due to dewatering and groundwater flow will be directed towards the centre of the pits in response to the hydraulic gradient. The contaminants will also migrate towards the pit centres with the flowing groundwater and will be intercepted as part of the dewatering. The contaminant plume is therefore not expected to reach the Limpopo River during mine operation
Noise	Cumulative impacts should be considered for the overall improvement of ambient noise levels. The project is considered a

Environmental Aspect	Cumulative Impacts
	causative source of noise pollution of negligible significance. The existing noise sources in the immediate area of the Project are typical noise sources such as vehicle activity on the main gravel roads. The Project is not expected to have cumulative impact or exacerbate current noise levels. This is primarily due to noise propagation likely to measure at a similar noise level to the existing ambient noise levels at the surrounding receptors.
Socio-Economic	Cumulative socio-economic impacts are impacts that could act together with other impacts, whether already existing or proposed new projects, resulting in an incremental effect on natural and social resources, social processes and /or socio-economic conditions. Cumulative impacts are usually large scale and more extensive than primary concentrated impacts and have the tendency to increase the intensity of impacts already predicted for a proposed project. Job creation, training and LED initiatives will have a cumulative positive impact on communities in the region as numerous new projects are being planned. Each project will require a workforce and all proposed mining operations will have SLP commitments regarding LED initiatives, training and education and services and infrastructure establishment. The Potential Development Area 1 has been earmarked as a mining zone and the numerous potential mines will have a significant socio-economic impact on the local communities, provided the local communities benefit from such initiatives. Similarly, the establishment of projects in the region will likely result in accelerated large scale population influx from other provinces and regions as people seek for job opportunities. The population influx into the region will result in increased pressure on available land, resources and services, as well as the potential for informal settlements, encroachment and land grabs and ultimately urban sprawl. All mining operations have a limited life of mine and the establishment of mining zones, such as the Potential Development Area 1, will result in the local economy and communities being dependent on mining activities. Once developments have reached their inevitable life of mine, the region could experience a considerable economic slump and it is critical that economic diversification is undertaken once the Potential Development Area 1 has been established.

10.5 Item 3(g)(vi): Methodology Used in Determining and Ranking the Nature, Significance, Consequence, Extent, Duration and Probability of Potential Environmental Impacts and Risks

Based on South African legislation and guidelines, the following criteria were taken into account when examining potentially significant impacts:

- Nature of impacts (induced/direct/indirect, positive/negative);
- Duration (short/medium/long-term, permanent(irreversible) / temporary (reversible), frequent/seldom);
- Extent (geographical area, size of affected population/habitat/species);
- Intensity (minimal, severe, replaceable/irreplaceable);
- Probability (high/medium/low probability); and
- Mitigation (as per mitigation hierarchy: avoid, mitigate or offset significant adverse impacts).

The significance rating process follows the established impact/risk assessment formula:

SIGNIFICANCE = CONSEQUENCE[17] x PROBABILITY[18] x NATURE[19]

The matrix (Table 10-60) calculates the rating out of 147 points, whereby intensity, extent, duration and probability are each rated out of seven as indicated in Table 10-59. The weight assigned to the various parameters is then multiplied by +1 for positive and -1 for negative impacts.

Impacts are rated prior to mitigation, and again after consideration of the mitigation has been applied; post-mitigation is referred to as the residual impact. The significance of an impact is determined and categorised into one of seven categories (The descriptions of the significance ratings are presented in Table 10-61).

It is important to note that the pre-mitigation rating takes into consideration the activity as proposed, (i.e., there may already be some mitigation included in the engineering design). If the specialist determines the potential impact is still too high, additional mitigation measures are proposed.

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[17] Consequence = Intensity + Extent + Duration

[18] Probability = Likelihood of and impact occurring

[19] Nature = Positive (+1) or Negative (-1) impact

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Table 10-59: Impact Assessment Parameter Ratings

Rating	Intensity		Spatial scale	Duration	Probability
	Negative Impacts ***(Type of Impact = -1)***	***Positive Impacts*** ***(Type of Impact = +1)***			
7	Very significant impact on the environment. Irreparable and irreplaceable damage to highly valued species, habitat or ecosystem. Persistent severe damage. Irreparable and irreplaceable damage to highly valued items of great cultural significance or complete breakdown of social order.	Noticeable, on-going social and environmental benefits which have improved the livelihoods and living standards of the local community in general and the environmental features.	<u>International</u> The effect will occur across international borders.	<u>Permanent: No Mitigation</u> The impact will remain long after the life of the Project. The impacts are irreversible.	<u>Certain/ Definite.</u> There are sound scientific reasons to expect that the impact will definitely occur.
6	Significant impact on highly valued species, habitat or ecosystem. Significant management and rehabilitation measures required to prevent irreplaceable impacts. Irreparable damage to highly valued items of cultural significance or breakdown of social order.	Great improvement to livelihoods and living standards of a large percentage of population, as well as significant increase in the quality of the receiving environment.	<u>National</u> Will affect the entire country.	<u>Beyond Project Life</u> The impact will remain for some time after the life of a Project.	<u>Almost certain/Highly probable</u> It is most likely that the impact will occur.

Rating	Intensity		Spatial scale	Duration	Probability
	Negative Impacts (Type of Impact = -1)	***Positive Impacts (Type of Impact = +1)***			
5	Very serious, long-term environmental impairment of ecosystem function that may take several years to rehabilitate. Very serious widespread social impacts. Irreparable damage to highly valued items.	On-going and widespread positive benefits to local communities which improves livelihoods, as well as a positive improvement to the receiving environment.	<u>Province/ Region</u> Will affect the entire province or region.	<u>Project Life</u> The impact will cease after the operational life span of the Project.	<u>Likely</u> The impact may occur.
4	Serious medium term environmental effects. Environmental damage can be reversed in less than a year. On-going serious social issues. Significant damage to structures / items of cultural significance.	Average to intense social benefits to some people. Average to intense environmental enhancements.	<u>Municipal Area</u> Will affect the whole municipal area.	<u>Long term</u> 6-15 years to reverse impacts.	<u>Probable</u> Has occurred here or elsewhere and could therefore occur.
3	Moderate, short-term effects but not affecting ecosystem function. Rehabilitation requires intervention of external specialists and can be done in less than a month. On-going social issues. Damage to items of cultural significance.	Average, on-going positive benefits, not widespread but felt by some.	<u>Local</u> Extending across the site and to nearby settlements.	<u>Medium term</u> 1-5 years to reverse impacts.	<u>Unlikely</u> Has not happened yet but could happen once in the lifetime of the Project, therefore there is a possibility that the impact will occur.

Rating	Intensity		Spatial scale	Duration	Probability
	Negative Impacts ***(Type of Impact = -1)***	***Positive Impacts*** ***(Type of Impact = +1)***			
2	Minor effects on biological or physical environment. Environmental damage can be rehabilitated internally with/ without help of external consultants. Minor medium-term social impacts on local population. Mostly repairable. Cultural functions and processes not affected.	Low positive impacts experience by very few of population.	<u>Limited</u> Limited to the site and its immediate surroundings.	<u>Short term</u> Less than 1 year to completely reverse the impact.	<u>Rare/ improbable</u> Conceivable, but only in extreme circumstances and/ or has not happened during lifetime of the Project but has happened elsewhere. The possibility of the impact materialising is very low as a result of design, historic experience or implementation of adequate mitigation measures.
1	Limited damage to minimal area of low significance that will have no impact on the environment. No irreplaceable loss of a significant aspect to the environment. Minimal social impacts, low-level repairable damage to commonplace structures.	Some low-level social and environmental benefits felt by very few of the population.	<u>Very limited</u> Limited to specific isolated parts of the site.	<u>Immediate</u> Less than 1 month to completely reverse the impact.	<u>Highly unlikely/None</u> Expected never to happen.

Table 10-60: Probability/Consequence Matrix

		Significance																																					
Probability	7	-147	-140	-133	-126	-119	-112	-105	-98	-91	-84	-77	-70	-63	-56	-49	-42	-35	-28	-21	21	28	35	42	49	56	63	70	77	84	91	98	105	112	119	126	133	140	147
	6	-126	-120	-114	-108	-102	-96	-90	-84	-78	-72	-66	-60	-54	-48	-42	-36	-30	-24	-18	18	24	30	36	42	48	54	60	66	72	78	84	90	96	102	108	114	120	126
	5	-105	-100	-95	-90	-85	-80	-75	-70	-65	-60	-55	-50	-45	-40	-35	-30	-25	-20	-15	15	20	25	30	35	40	45	50	55	60	65	70	75	80	85	90	95	100	105
	4	-84	-80	-76	-72	-68	-64	-60	-56	-52	-48	-44	-40	-36	-32	-28	-24	-20	-16	-12	12	16	20	24	28	32	36	40	44	48	52	56	60	64	68	72	76	80	84
	3	-63	-60	-57	-54	-51	-48	-45	-42	-39	-36	-33	-30	-27	-24	-21	-18	-15	-12	-9	9	12	15	18	21	24	27	30	33	36	39	42	45	48	51	54	57	60	63
	2	-42	-40	-38	-36	-34	-32	-30	-28	-26	-24	-22	-20	-18	-16	-14	-12	-10	-8	-6	6	8	10	12	14	16	18	20	22	24	26	28	30	32	34	36	38	40	42
	1	-21	-20	-19	-18	-17	-16	-15	-14	-13	-12	-11	-10	-9	-8	-7	-6	-5	-4	-3	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21
		-21	-20	-19	-18	-17	-16	-15	-14	-13	-12	-11	-10	-9	-8	-7	-6	-5	-4	-3	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21
		Consequence																																					

Table 10-61: Significance Rating Description

Score	Description	Rating
109 to 147	A very beneficial impact which may be sufficient by itself to justify implementation of the Project. The impact may result in permanent positive change.	**Major (positive)**
73 to 108	A beneficial impact which may help to justify the implementation of the Project. These impacts would be considered by society as constituting a major and usually a long-term positive change to the (natural and/or social) environment.	Moderate (positive)
36 to 72	An important positive impact. The impact is insufficient by itself to justify the implementation of the Project. These impacts will usually result in positive medium to long-term effect on the social and/or natural environment.	Minor (positive)
3 to 35	A small positive impact. The impact will result in medium to short term effects on the social and/or natural environment.	Negligible (positive)
-3 to -35	An acceptable negative impact for which mitigation is desirable but not essential. The impact by itself is insufficient even in combination with other low impacts to prevent the development being approved. These impacts will result in negative medium to short term effects on the social and/or natural environment. The impacts are reversible and will not result in the loss of irreplaceable aspects.	Negligible (negative)
-36 to -72	An important negative impact which requires mitigation. The impact is insufficient by itself to prevent the implementation of the Project but which in conjunction with other impacts may prevent its implementation. These impacts will usually result in negative medium to long-term effect on the social and/or natural environment.	Minor (negative)
-73 to -108	A serious negative impact which may prevent the implementation of the Project. These impacts would be considered by society as constituting a major and usually a long-term change to the (natural and/or social) environment and result in severe effects. The impacts may result in the irreversible damage to irreplaceable environmental or social aspects should mitigation measures not be implemented.	Moderate (negative)
-109 to -147	A very serious negative impact which may be sufficient by itself to prevent implementation of the Project. The impact may result in permanent change. Very often these impacts are immitigable and usually result in very severe effects. The impacts will be irreplaceable and irreversible should adequate mitigation and management measures not be successfully implemented.	Major (negative)

10.6 Item 3(g)(vii): The Positive and Negative Impacts that the Proposed Activity (in terms of the Initial Site Layout) and Alternatives will have on the Environment and the Community that may be Affected

The site layout is illustrated in Plan 4, Appendix A; although the activities will have potential negative impacts on the environment, the layout has been designed to prevent and minimise the significance of the environmental impacts as far as possible. The final infrastructure layout has taken into consideration the specialist investigations, as well as any input provided by I&APs during the consultation process.

10.6.1 Site Layout Considerations

The site layout alternatives are restricted due to the location and quality of the coal reserves, as well as the ecologically sensitive and wetland areas that have been avoided and excluded as part of the open pit area. The location of the open pit has been selected to ensure that the most economical, highest yield and quality coal reserves are mined and that the Project is feasible. A 100 m buffer will be implemented between the open pit and the wetland areas, as well as outside the 1:100 year flood lines, to prevent potential impacts on the water resources on site, as well as downstream water users of the Limpopo River. In addition, a topsoil berm will be constructed down-gradient of the open pit to ensure that dirty water from the open pit does not report to the catchment. The alternatives related to the Project include the location of the infrastructure and overburden dump.

The overburden dump, crushing station and ROM tip area and infrastructure have been located up-gradient of the open pit and within the demarcated dirty water area. This dirty water area has a cut off trench down-gradient to the north to channel all water from these areas to the PCDs. The infrastructure and overburden dump has been located to avoid all water courses. The overland conveyor route will make use of existing servitudes and access routes to limit the potential impacts associated with construction activities and site clearing. The ROM coal will be transported by the conveyor to the Boikarabelo Coal Mine for beneficiation, preventing the need for a wash plant within Kubu Coal Mine. The ROM coal will be supplied to Boikarabelo Coal Mine on a FOM basis.

10.6.2 Positive Impacts

The development of the Kubu Coal Mine will have significant positive socio-economic impacts on local communities, local and district municipalities and nationally. The Project will result in the mining of 14 million tonnes of coal per annum. Beneficiation at the Boikarabelo Coal Mine will result in the production of 6 million saleable tonnes with 3 million tonnes sold to the local markets for power generation. The remaining 3 million tonnes of coal per annum will be sold to the international market. Approximately 8 million tonnes of ROM coal discard will be produced which will be used as backfill material in the open void. The production of the saleable coal will result in contributions to the GDP through taxes and royalties.

In addition, the Kubu Coal Mine will require approximately 1 500 employees during the construction phase and a further 390 employees during the operational phase, reducing the unemployment rate of the municipality. The Kubu Coal Mine will also implement the commitments outlined in its SLP, which will include skills transfer and upliftment of the local communities.

10.6.3 Negative Impacts

The development of the proposed Project may result in numerous impacts on the receiving environment. Although the wetland areas, Limpopo River floodplain and high ecological sensitivity areas have been avoided, there is a likelihood that such areas will still be impacted upon, due to vegetation clearing and mining activities. The removal of vegetation will reduce the available habitats and biodiversity in the Project area, as well as impacting on Red Data and Protected tree species such as *A. erioloba* and *C. imberbe*. In addition, the vegetation removal results in soils being susceptible to erosion, which may result in the sedimentation of surface water resources, impacting on water quality and aquatic biota. The suspension of soil particles is also likely to result in dust emissions, impacting on the ambient air quality and sensitive receptors, although the predicted dust deposition rates at the nearest receptors and across the South Africa – Botswana border are within the NDCR, 2013, limits.

The dewatering of the pit, or evaporation of groundwater from the development of the open pit, may have a drawdown impact on surrounding areas, potentially impacting on surrounding groundwater users. Boreholes surrounding the Project area will experience the greatest drawdown impact, although the cone of depression is not expected to extend to the Limpopo River. Similarly, the cone of depression will result in a hydraulic gradient towards the open pit; any contamination plumes will migrate towards the open pit and is not expected to impact on the Limpopo River. A numerical model specific to Kubu Coal Mine must be developed prior to mining activities being undertaken.

Although negative impacts are likely to occur as a result of the Project, the mine layout has been developed to reduce the potential impacts on the wetland areas and floodplains of the Limpopo River, as well as the high ecological sensitivity areas in the north by avoiding and implementing a 100 m buffer from such areas. In addition, the overburden dump and infrastructure has been located up-gradient of the open pit, resulting in any contaminated runoff from the dump and infrastructure area being captured and channelled to the PCDs. The site layout ensures that the negative impacts associated with the mining activities are reduced as far as possible, whilst ensuring that the positive impacts associated with the development of Kubu Coal Mine can be realised.

10.7 Item 3(g)(viii): The Possible Mitigation Measures that could be applied and the Level of Risk

This section relates to possible mitigation measures that could be applied, based on the stakeholder issues and comments received. Stakeholder consultation was undertaken as part of the Scoping Phase, as outlined in Section 8.2 and a summary of the stakeholder comments received during the Scoping Phase are provided in Table 8-5. The predominant issues and comments received by stakeholders to date were regarding the use of water within the Project area, as well as commitments and potential impacts to I&APs and the local communities.

Water will be supplied by Boikarabelo Coal Mine which will in turn source its water from the Marapong Treatment Works, as well as potable water utilised from abstraction boreholes. All efforts have been made in the mine plan to avoid potential impacts to water resources as a result of the Project. The topsoil berm will be located to the north of the open pit and a 100 m buffer has been implemented between the topsoil berm and the wetland areas. A Storm Water Management Plan will be implemented to separate all dirty and clean water streams and all dirty water will be diverted to the PCDs on site. The storm water management structures will be designed according to GN R704 of the NWA. Surface water, groundwater and aquatic monitoring will be undertaken throughout the life of the Project, as per the monitoring programme in Section 9, to identify any potential impacts on surface water resources.

The predominant comments and issues raised by stakeholders regarding socio-economic issues were surrounding the commitments of Kubu Coal Mine. The commitments of the SLP will only be implemented should a Mining Right be granted for the Project. The SLP has commitments to education and training for local communities and LED initiatives. WOC intends to engage with the LLM regarding the SLP commitments. Population influx is a concern of I&APs in the region and that population influx may result in socio-economic impacts for local communities, as well as limiting training and employment opportunities for the local residents. To ensure that local communities benefit from training and employment opportunities, it has been recommended that contractors make use of the local SMME database and agreements written into the contractor specifications to ensure that local recruitment and procurement obligations are met.

10.8 Item 3(g)(ix): Motivation where No Alternatives Sites were Considered

Alternative sites were not considered for the location of the open pit. The location of the mineral resource determines the open pit location, with the high ecological sensitivities and wetland areas being excluded from the open pit layout and a 100 m buffer implemented. The location of the open pit was also determined based on the results of the prospecting activities undertaken on site, with a reserve determined for the southwest of the Project site and the remaining areas of the Project area being considered a resource. Infrastructure layout alternatives were considered and detailed in Section 8.1 above, however, with the development and use of the Boikarabelo Coal Mine infrastructure for beneficiation purposes, the infrastructure requirements and alternatives were limited.

10.9 Item 3(g)(x): Statement Motivating the Alternative Development Location within the Overall Site

The infrastructure layout has been provided in Plan 4, Appendix A. The site layout has taken the specialist investigations into consideration, as well as I&APs' issues and concerns. The site layout has been selected based on the following motivation:

- The overburden dump is located up-gradient of the open pit and falls within the dirty water management area;
- The infrastructure and ROM tip area and crusher are located adjacent to the overburden dump, up-gradient of the open pit and within the dirty water management area;
- The open pit has been designed to take into consideration the highest value coal resource and has excluded high ecological sensitivities and wetland areas with a 100 m buffer implemented, as well as having been placed outside of the 1:100 year floodlines of the Limpopo River. The removal of the wetland areas and floodplain of the Limpopo River from the mine plan has resulted in 378 ha of coal resources being excluded from the mine plan;
- The conveyor route will follow existing servitudes to prevent unnecessary or excessive clearing and disturbance of vegetation; and
- The topsoil dumps will be located to the north of the open pit to act as a berm to prevent potential contaminants from reporting to the surrounding environment.

11 Item 3(h): Full Description of the Process undertaken to Identify, Assess and Rank the Impacts and Risks the Activity will impose on the Preferred Site (In respect of the final site layout plan) through the Life of the Activity

The proposed infrastructure layout for the Kubu Coal Mine was informed by the wetland delineation, high ecological sensitivity areas and the 1:100 year floodline of the Limpopo River. These initial specialist studies were undertaken in 2009 and the findings were ground-truthed during the 2015 site visits. The Scoping Phase of the project identified potential impacts that may arise as a result of the proposed Project and detailed the plan of study for specialist studies to determine the sensitives and baseline environment of the Project area.

Following the identification of potential impacts and detailed baseline environment, the impacts were assessed utilising the Digby Wells' methodology which assesses the nature of the impact, duration and extent, intensity including the aspects irreplaceability, and the probability of the impact occurring. The EIA methodology is detailed in Section 10.5. Following the assessment of the potential impacts, mitigation measures were provided and the potential impacts were assessed post-mitigation. The significance of the pre-mitigation impacts, the proposed mitigation measures and the post-mitigation significance ratings are detailed per environmental aspect per phase of the project in Section 10. The potential impacts assessed are based on the preferred site layout (Plan 4, Appendix A).

12 Item 3(i): Assessment of each Identified Potentially Significant Impact and Risk

The potential impacts per activity are detailed in Table 12-1. The discussion of the impacts are provided in Section 10, along with the impact ratings prior to and post the implementation of mitigation and management measures, as well as providing a list of the mitigation measures.

Table 12-1: Assessment of Each Identified Impact

Activity	Potential Impact	Aspects Affected	Phase	Significance Prior to Mitigation	Mitigation Type	Significance Post Mitigation
Construction Phase						
Site Clearing	Fugitive dust generation deteriorating ambient air quality	Air Quality	Construction Phase	Minor (negative)	Manage through: ▪ Dust monitoring plan. ▪ Dust suppression.	Negligible (negative)
	Loss of topsoil as a resource	Soils	Construction Phase	Minor (negative)	Manage through: ▪ Storm Water Management Plan; ▪ Erosion berms; and ▪ Rehabilitation Plan.	Negligible (negative)
	Loss of land capability	Soils	Construction Phase	Minor (negative)	N/A	Minor (negative)
	Loss of vegetation, available habitats and SSC, all of which reduce biodiversity	Fauna and Flora	Construction Phase	Moderate (negative)	Manage through: ▪ Nursery establishment. Compensate through: ▪ Biodiversity land management plan.	Moderate (negative)
	Instream habitat modification	Aquatics	Construction Phase	Minor (negative)	Manage through: ▪ Storm Water Management Plan.	Negligible (negative)
	Siltation of surface water resources deteriorating water quality	Surface Water	Construction Phase	Minor (negative)	Manage through: ▪ Storm Water Management Plan; and ▪ Erosion berms.	Minor (negative)
	Reduction in groundwater recharge	Groundwater	Construction Phase	Minor (negative)	Manage through: ▪ Rehabilitation of disturbed areas; and ▪ Designated access routes.	Negligible (negative)
	Generation of noise impacting sensitive receptors	Noise	Construction Phase	Negligible (negative)	Prevent through: ▪ Regular equipment, vehicles and machinery inspections and	Negligible (negative)

Activity	Potential Impact	Aspects Affected	Phase	Significance Prior to Mitigation	Mitigation Type	Significance Post Mitigation
					maintenance	
	Damage and destruction to unidentified heritage resources	Heritage Resources	Construction Phase	Moderate (negative)	Prevent through: ▪ Chance Find Procedures	Negligible (positive)
Infrastructure Area	Fugitive dust generation deteriorating ambient air quality	Air Quality	Construction Phase	Minor (negative)	Manage through: ▪ Dust monitoring plan. ▪ Dust suppression.	Negligible (negative)
	Reduction in groundwater recharge	Groundwater	Construction Phase	Minor (negative)	Manage through: ▪ Rehabilitation of disturbed areas; and ▪ Designated access routes.	Negligible (negative)
	Generation of noise impacting sensitive receptors	Noise	Construction Phase	Negligible (negative)	Prevent through: ▪ Regular equipment, vehicles and machinery inspections and maintenance	Negligible (negative)
Topsoil Berm	Fugitive dust generation deteriorating ambient air quality	Air Quality	Construction Phase	Minor (negative)	Manage through: ▪ Dust monitoring plan. ▪ Dust suppression.	Negligible (negative)
	Loss of topsoil as a resource	Soils	Construction Phase Operational Phase	Minor (negative)	Manage through: ▪ Storm Water Management Plan; ▪ Erosion berms; and ▪ Rehabilitation Plan.	Negligible (negative)
	Instream habitat modification	Aquatics	Construction Phase Operational Phase	Minor (negative)	Manage through: ▪ Storm Water Management Plan.	Negligible (negative)
	Siltation of surface water resources deteriorating water quality	Surface Water	Construction Phase Operational Phase	Minor (negative)	Manage through: ▪ Storm Water Management Plan; and ▪ Erosion berms.	Minor (negative)
Haul and Access Roads	Reduction in groundwater	Groundwater	Construction Phase	Minor (negative)	Manage through: ▪ Rehabilitation of disturbed	Negligible (negative)

Activity	Potential Impact	Aspects Affected	Phase	Significance Prior to Mitigation	Mitigation Type	Significance Post Mitigation
	recharge				areas; and ▪ Designated access routes.	
Employment and Procurement	Population influx and related impacts	Socio-economic	Construction Phase Operational Phase	Moderate (negative)	Manage through: ▪ Expectation management and continuous engagement; and ▪ Centre establishment for victims.	Moderate (negative)
	LED initiatives and economy stimulation	Socio-economic	Construction Phase Operational Phase	Minor (positive)	Enhance through: ▪ Promote local recruitment and SMMEs; and ▪ Contractor specifications.	Minor (positive)
	Skills upliftment and training for local communities	Socio-economic	Construction Phase Operational Phase	Moderate (positive)	Enhance through: ▪ Career guidance with local communities; ▪ Skills gap analysis; and ▪ Educational programmes and training.	Moderate (positive)
Operational Phase						
Open Pit Mining	Fugitive dust generation deteriorating ambient air quality	Air Quality	Operational Phase	Moderate (negative)	Manage through: ▪ Wet drilling; and ▪ Dust suppression.	Minor (negative)
	Instream habitat modification	Aquatics	Operational Phase	Minor (negative)	Manage through: ▪ Storm Water Management Plan; and ▪ Water quality monitoring.	Negligible (negative)
	Loss of sub-surface water to wetlands and riparian zones	Wetlands	Operational Phase	Minor (negative)	N/A	Minor (negative)
	Contamination of surface water resources	Surface Water	Operational Phase	Minor (negative)	Manage through: ▪ Storm Water Management Plan; and ▪ Water quality monitoring.	Minor (negative)

Activity	Potential Impact	Aspects Affected	Phase	Significance Prior to Mitigation	Mitigation Type	Significance Post Mitigation
	Lowering of the groundwater levels due to dewatering	Groundwater	Operational Phase	Moderate (negative)	Manage through: ▪ Numerical model development; and ▪ Groundwater monitoring.	Minor (negative)
	Generation of noise impacting sensitive receptors	Noise	Operational Phase	Negligible (negative)	Prevent through: ▪ Regular equipment, vehicles and machinery inspections and maintenance	Negligible (negative)
Haul and Access Roads	Fugitive dust generation deteriorating ambient air quality	Air Quality	Operational Phase	Minor (negative)	Manage through: ▪ Dust monitoring plan. ▪ Dust suppression.	Minor (negative)
	Alien invasive vegetation and loss of biodiversity	Fauna and Flora	Operational Phase	Moderate (negative)	Manage through: ▪ Alien Invasive Management Plan	Minor (negative)
	Generation of noise impacting sensitive receptors	Noise	Operational Phase	Negligible (negative)	Prevent through: ▪ Regular equipment, vehicles and machinery inspections and maintenance	Negligible (negative)
Storage of Overburden	Fugitive dust generation deteriorating ambient air quality	Air Quality	Operational Phase	Minor (negative)	Manage through: ▪ Dust monitoring plan. ▪ Dust suppression.	Minor (negative)
	Instream habitat modification	Aquatics	Operational Phase	Negligible (negative)	Manage through: ▪ Storm Water Management Plan; and ▪ Water quality monitoring.	Negligible (negative)
	Contamination of surface water resources	Surface Water	Operational Phase	Minor (negative)	Manage through: ▪ Storm Water Management Plan; and ▪ Water quality monitoring.	Minor (negative)
	Contaminated groundwater	Groundwater	Operational Phase	Minor (negative)	Manage through:	Minor (negative)

Activity	Potential Impact	Aspects Affected	Phase	Significance Prior to Mitigation	Mitigation Type	Significance Post Mitigation
	through seepage				▪ Overburden dump design; ▪ Lining of overburden dump; and ▪ Groundwater monitoring.	
ROM Tip Area	Fugitive dust generation deteriorating ambient air quality	Air Quality	Operational Phase	Minor (negative)	Manage through: ▪ Dust monitoring plan. ▪ Dust suppression.	Minor (negative)
	Instream habitat modification	Aquatics	Operational Phase	Negligible (negative)	Manage through: ▪ Storm Water Management Plan; and ▪ Water quality monitoring.	Negligible (negative)
	Contamination of surface water resources	Surface Water	Operational Phase	Minor (negative)	Manage through: ▪ Storm Water Management Plan; and ▪ Water quality monitoring.	Minor (negative)
	Contaminated groundwater through seepage	Groundwater	Operational Phase	Minor (negative)	Manage through: ▪ Lining of ROM tip area; and ▪ Groundwater monitoring.	Minor (negative)
	Generation of noise impacting sensitive receptors	Noise	Operational Phase	Negligible (negative)	Prevent through: ▪ Regular equipment and machinery inspections and maintenance	Negligible (negative)
PCDs	Instream habitat modification	Aquatics	Operational Phase	Minor (negative)	Manage through: ▪ Storm Water Management Plan; and ▪ Water quality monitoring.	Negligible (negative)
	Contamination of surface water resources	Surface Water	Operational Phase	Minor (negative)	Manage through: ▪ Storm Water Management Plan; and ▪ Water quality monitoring.	Minor (negative)
	Reduction in catchment yield	Surface Water	Operational Phase	Minor (negative)	N/A	Minor (negative)

Activity	Potential Impact	Aspects Affected	Phase	Significance Prior to Mitigation	Mitigation Type	Significance Post Mitigation
Employment and Procurement	Local development	Socio-economic	Operational Phase	Moderate (negative)	Manage and enhance through: ▪ Career guidance with local communities; ▪ Skills gap analysis; and ▪ Expectation management.	Moderate (positive)
	Health and safety	Socio-economic	Operational Phase	Moderate (negative)	Manage and enhance through: ▪ Transportation benefits.	Minor (positive)
	Population influx and related social impacts	Socio-economic	Operational Phase	Minor (negative)	Manage and enhance through: ▪ Personal finance management education.	Minor (positive)
Decommissioning Phase						
Rehabilitation	Fugitive dust generation deteriorating ambient air quality	Air Quality	Decommissioning Phase	Minor (negative)	Manage through: ▪ Dust monitoring plan. ▪ Dust suppression.	Negligible (negative)
	Loss of topsoil as a resource through soil compaction and erosion.	Soils	Decommissioning Phase	Minor (negative)	Manage through: ▪ Rehabilitation Plan.	Negligible (negative)
	Alien invasive vegetation establishment.	Fauna and Flora	Decommissioning Phase	Moderate (negative)	Manage through: ▪ Alien Invasive Management Plan.	Moderate (negative)
	Instream habitat modification	Aquatics	Decommissioning Phase	Minor (negative)	Manage through: ▪ Rehabilitation Plan; and ▪ Vegetation establishment.	Negligible (negative)
	Siltation of surface water resources deteriorating water quality	Surface Water	Decommissioning Phase	Minor (negative)	Manage through: ▪ Rehabilitation Plan; and ▪ Vegetation establishment.	Minor (negative)
	Contaminated groundwater through seepage	Groundwater	Decommissioning Phase	Minor (negative)	Manage through: ▪ Groundwater monitoring.	Minor (negative)
	Generation of noise impacting sensitive receptors	Noise	Decommissioning Phase	Negligible (negative)	Prevent through: ▪ Regular equipment and machinery inspections and	Negligible (negative)

Activity	Potential Impact	Aspects Affected	Phase	Significance Prior to Mitigation	Mitigation Type	Significance Post Mitigation
					maintenance	
Infrastructure Area	Loss of topsoil as a resource through soil compaction and erosion.	Soils	Decommissioning Phase	Minor (negative)	Manage through: ▪ Rehabilitation Plan.	Negligible (negative)
	Generation of noise impacting sensitive receptors	Noise	Decommissioning Phase	Negligible (negative)	Prevent through: ▪ Regular equipment and machinery inspections and maintenance	Negligible (negative)
Haul and Access Roads	Loss of topsoil as a resource through soil compaction and erosion.	Soils	Decommissioning Phase	Minor (negative)	Manage through: ▪ Rehabilitation Plan.	Negligible (negative)
Employment and Procurement	Dependency on mine and loss of jobs	Socio-economic	Decommissioning Phase	Minor (negative)	Manage through: ▪ SLP implementation; and ▪ Closure Plan development.	Minor (negative)

13 Item 3(j): Summary of Specialist Reports

The summary of the specialist impact assessment reports undertaken for the Kubu Coal Mine is detailed in Table 13-1.

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Table 13-1: Summary of Specialist Impact Assessments for the Kubu Coal Mine Project

List of studies undertaken	Recommendations of specialist reports	Specialist Recommendations that have been included in the EIA report (Mark with an X)	Reference to applicable section of report where specialist recommendations have been included
Air Quality Impact Assessment	▪ Significance of impacts ▪ Mitigation measures ▪ Monitoring Programme	X	The Air Quality Impact Assessment has been included in Appendix D. All mitigation and management measures included in this report were recommended by the Air Quality Specialist, as well as the monitoring programmes. This includes the impact assessment and mitigation measures as discussed in Section 10, as well as the recommendations provided in Part B Sections 5, 6 and 7 and the monitoring provided in Section 9.
Soil Impact Assessment	▪ Significance of impacts ▪ Mitigation measures	X	The Soil Impact Assessment has been included in Appendix E. All mitigation and management measures included in this report were recommended by the Soil Specialist. This includes the impact assessment and mitigation measures as discussed in Section 10, as well as the recommendations provided in Part B, Sections 5, 6 and 7.
Fauna and Flora Impact Assessment	▪ Significance of impacts ▪ Mitigation measures ▪ Monitoring Programme	X	The Fauna and Flora Impact Assessment has been included in Appendix F. All mitigation and management measures included in this report were recommended by the Fauna and Flora Specialist, as well as the monitoring programmes. This includes the impact assessment and mitigation measures as discussed in Section 10, as well as the recommendations provided in Part B, Sections 5, 6 and 7 and the monitoring provided in Section 9.
Aquatics Impact Assessment	▪ Significance of impacts ▪ Mitigation measures ▪ Monitoring Programme	X	The Aquatics Impact Assessment has been included in Appendix G. All mitigation and management measures included in this report were recommended by the Aquatics Specialist, as well as the monitoring programmes. This includes the impact assessment and mitigation measures as discussed in Section 10, as well as the recommendations provided in Part B, Sections 5, 6 and 7 and the monitoring provided in Section 9.
Wetlands Impact Assessment	▪ Assessment of potential impacts	X	The Wetlands Impact Assessment has been included in Appendix H. The impact assessment is discussed in Section 10.
Surface Water Impact Assessment	▪ Significance of impacts	X	The Surface Water Impact Assessment has been

List of studies undertaken	**Recommendations of specialist reports**	**Specialist Recommendations that have been included in the EIA report (Mark with an X)**	**Reference to applicable section of report where specialist recommendations have been included**
	▪ Mitigation measures ▪ Monitoring Programme		included in Appendix I. All mitigation and management measures included in this report were recommended by the Surface Water Specialist, as well as the monitoring programmes. This includes the impact assessment and mitigation measures as discussed in Section 10, as well as the recommendations provided in Part B, Sections 5, 6 and 7 and the monitoring provided in Section 9.
Groundwater Impact Assessment	▪ Detailed baseline environment.	X	The Groundwater Impact Assessment has been included in Appendix J. All mitigation and management measures included in this report were recommended by the Groundwater Specialist, as well as the monitoring programmes. This includes the impact assessment and mitigation measures as discussed in Section 10, as well as the recommendations provided in Part B, Sections 5, 6 and 7 and the monitoring provided in Section 9
Noise Input and impact assessment	▪ Significance of impacts ▪ Mitigation measures	X	All mitigation and management measures included in this report were recommended by the Noise Specialist. This includes the impact assessment and mitigation measures as discussed in Section 10, as well as the recommendations provided in Part B, Sections 5, 6 and 7.
Social Impact Assessment	▪ Significance of impacts ▪ Mitigation and enhancement measures	X	The Social Impact Assessment has been included in Appendix K. All mitigation and management measures included in this report were recommended by the Social Specialist. This includes the impact assessment and mitigation measures as discussed in Section 10, as well as the recommendations provided in Part B, Sections 5, 6 and 7.
Archaeology Impact Assessment	▪ Significance of impacts ▪ Mitigation measures	X	The Archaeology Impact Assessment has been included in Appendix L.

14 Item 3(k): Environmental Impact Statement

14.1 Item 3(k)(i): Summary of the Key Findings of the Environmental Impact Assessment

The Environmental Impact Statement is utilised to summarise all of the potential significant environmental and social impacts identified during each phase of the proposed Project. The significance of the significant impacts associated with the biophysical and social environment, pre-mitigation and post-mitigation, is summarised in Table 14-1.

Table 14-1: Summary of the Potential Impacts on the Biophysical and Social Environment

Activity	Potential Impact	Aspects Affected	Significance Prior to Mitigation	Significance Post Mitigation
Construction Phase				
Site Clearing	Fugitive dust generation deteriorating ambient air quality	Air Quality	Minor (negative)	Negligible (negative)
	Loss of topsoil as a resource	Soils	Minor (negative)	Negligible (negative)
	Loss of land capability	Soils	Minor (negative)	Minor (negative)
	Loss of vegetation, available habitats and SSC, all of which reduce biodiversity	Fauna and Flora	Moderate (negative)	Moderate (negative)
	Instream habitat modification	Aquatics	Minor (negative)	Negligible (negative)
	Siltation of surface water resources deteriorating water quality	Surface Water	Minor (negative)	Minor (negative)
	Reduction in groundwater recharge	Groundwater	Minor (negative)	Negligible (negative)
	Generation of noise impacting sensitive receptors	Noise	Negligible (negative)	Negligible (negative)
	Damage and destruction	Heritage	Moderate	Negligible

Activity	Potential Impact	Aspects Affected	Significance Prior to Mitigation	Significance Post Mitigation
	to unidentified heritage resources	Resources	(negative)	(positive)
Infrastructure Area	Fugitive dust generation deteriorating ambient air quality	Air Quality	Minor (negative)	Negligible (negative)
	Reduction in groundwater recharge	Groundwater	Minor (negative)	Negligible (negative)
	Generation of noise impacting sensitive receptors	Noise	Negligible (negative)	Negligible (negative)
Topsoil Berm	Fugitive dust generation deteriorating ambient air quality	Air Quality	Minor (negative)	Negligible (negative)
	Loss of topsoil as a resource	Soils	Minor (negative)	Negligible (negative)
	Instream habitat modification	Aquatics	Minor (negative)	Negligible (negative)
	Siltation of surface water resources deteriorating water quality	Surface Water	Minor (negative)	Minor (negative)
Haul and Access Roads	Reduction in groundwater recharge	Groundwater	Minor (negative)	Negligible (negative)
Employment and Procurement	Population influx and related impacts	Socio-economic	Moderate (negative)	Moderate (negative)
	LED initiatives and economy stimulation	Socio-economic	Minor (positive)	Minor (positive)
	Skills upliftment and training	Socio-economic	Moderate (positive)	Moderate (positive)
Operational Phase				
Open Pit Mining	Fugitive dust generation deteriorating ambient air	Air Quality	Moderate (negative)	Minor (negative)

Activity	Potential Impact	Aspects Affected	Significance Prior to Mitigation	Significance Post Mitigation
	quality			
	Instream habitat modification	Aquatics	Minor (negative)	Negligible (negative)
	Loss of sub-surface water to wetlands and riparian zones	Wetlands	Minor (negative)	Minor (negative)
	Contamination of surface water resources	Surface Water	Minor (negative)	Minor (negative)
	Lowering of the groundwater levels due to dewatering	Groundwater	Moderate (negative)	Minor (negative)
	Generation of noise impacting sensitive receptors	Noise	Negligible (negative)	Negligible (negative)
Haul and Access Roads	Fugitive dust generation deteriorating ambient air quality	Air Quality	Minor (negative)	Minor (negative)
	Alien invasive vegetation and loss of biodiversity	Fauna and Flora	Moderate (negative)	Minor (negative)
	Generation of noise impacting sensitive receptors	Noise	Negligible (negative)	Negligible (negative)
Storage of Overburden	Fugitive dust generation deteriorating ambient air quality	Air Quality	Minor (negative)	Minor (negative)
	Instream habitat modification	Aquatics	Negligible (negative)	Negligible (negative)
	Contamination of surface water resources	Surface Water	Minor (negative)	Minor (negative)
	Contaminated groundwater through seepage	Groundwater	Minor (negative)	Minor (negative)

Activity	Potential Impact	Aspects Affected	Significance Prior to Mitigation	Significance Post Mitigation
ROM Tip Area	Fugitive dust generation deteriorating ambient air quality	Air Quality	Minor (negative)	Minor (negative)
	Instream habitat modification	Aquatics	Negligible (negative)	Negligible (negative)
	Contamination of surface water resources	Surface Water	Minor (negative)	Minor (negative)
	Contaminated groundwater through seepage	Groundwater	Minor (negative)	Minor (negative)
	Generation of noise impacting sensitive receptors	Noise	Negligible (negative)	Negligible (negative)
PCDs	Instream habitat modification	Aquatics	Minor (negative)	Negligible (negative)
	Contamination of surface water resources	Surface Water	Minor (negative)	Minor (negative)
	Reduction in catchment yield	Surface Water	Minor (negative)	Minor (negative)
Employment and Procurement	Local development	Socio-economic	Moderate (negative)	Moderate (positive)
	Health and safety	Socio-economic	Moderate (negative)	Minor (positive)
	Population influx and related impacts	Socio-economic	Minor (negative)	Minor (positive)
Decommissioning Phase				
Rehabilitation	Fugitive dust generation deteriorating ambient air quality	Air Quality	Minor (negative)	Negligible (negative)
	Loss of topsoil as a resource through soil	Soils	Minor (negative)	Negligible (negative)

Activity	Potential Impact	Aspects Affected	Significance Prior to Mitigation	Significance Post Mitigation
	compaction and erosion.			
	Alien invasive vegetation establishment.	Fauna and Flora	Moderate (negative)	Moderate (negative)
	Instream habitat modification	Aquatics	Minor (negative)	Negligible (negative)
	Siltation of surface water resources deteriorating water quality	Surface Water	Minor (negative)	Minor (negative)
	Contaminated groundwater through seepage	Groundwater	Minor (negative)	Minor (negative)
	Generation of noise impacting sensitive receptors	Noise	Negligible (negative)	Negligible (negative)
Infrastructure Area	Loss of topsoil as a resource through soil compaction and erosion.	Soils	Minor (negative)	Negligible (negative)
	Generation of noise impacting sensitive receptors	Noise	Negligible (negative)	Negligible (negative)
Haul and Access Roads	Loss of topsoil as a resource through soil compaction and erosion.	Soils	Minor (negative)	Negligible (negative)
Employment and Procurement	Dependency on mine and loss of jobs	Socio-economic	Minor (negative)	Minor (negative)

14.2 Item 3(k)(ii): Final Site Map

The infrastructure layout plan for the Kubu Coal Mine is illustrated in Plan 4, Appendix A. A composite plan is provided in Plan 24, Appendix A.

14.3 Item 3(k)(iii): Summary of the Positive and Negative Implications and Risks of the Proposed Activity and Identified Alternatives

The potential environmental impacts associated with the Kubu Coal Mine are predominantly minor (negative) and are reduced to negligible (negative) with the implementation of mitigation measures. The site clearing and construction activities may result in soil compaction and soil erosion which has a number of interlinking impacts. The loss of topsoil due to erosion will impact the success of the rehabilitation activities post operation. In addition, runoff from the Project site may be saturated with suspended or dissolved solids from eroded soils. The impacted runoff may flow into water resources and impact on surface water quality, as well as the aquatic ecology within these systems due to habitat modification.

The potential significant impacts relate to the loss of vegetation, particularly Red Data and Protected tree species *A. erioloba* and *C. imberbe*, potential damage or destruction to unidentified heritage resources, population influx and the cone of depression associated with the dewatering of the aquifers to allow for safe mining activities to be undertaken.. The loss of SCC during site clearing is inevitable and the clearance of vegetation will also impact on available habitats and reduce the biodiversity of the area, while encroachment and establishment of alien invasive vegetation on disturbed areas is likely.

The cone of depression will occur due to dewatering of the open pit which is a necessity to allow for safe mining conditions. The cone of depression will lower water tables around the open pit, with the maximum extent of drawdown experienced 2.8 km to the east, based on the numerical model developed for the adjacent Boikarabelo Coal Mine. The drawdown will impact on groundwater users as pumping heads will increase and boreholes potentially run dry depending on their location. This impact will be more sever should the Boikarabelo Coal Mine and Kubu Coal Mine operate in tandem.

The commencement of the Kubu Coal Mine will have positive impacts, particularly regarding the SLP commitments, once approved by the municipality, to be undertaken by WOC. The SLP commitments will include the skills upliftment and training of the local communities, prioritised employment, LED initiatives and services and infrastructure establishment and upgrades. Employment and education have been raised as concerns by stakeholders from local communities and the commencement of the Project will aid in addressing such concerns.

In addition, there is local and global demand for coal and the Kubu Coal Mine will produce, via beneficiation at the adjacent Boikarabelo Coal Mine, 3 million tonnes of product coal for the local market and 3 million tonnes of product coal for the international market. This will contribute to the local, regional and national GDP through taxes and royalties.

15 Item 3(l): Proposed Impact Management Objectives and the Impact Management Outcomes for Inclusion in the EMPR

The EMP seeks to achieve a required end state and describes how activities that have, or could have, an adverse impact on the environment will be mitigated, controlled and monitored.

The EMP will address the environmental impacts during the construction, operational and decommissioning phases of the Project. Due regard must be given to environmental protection during the entire Project; a number of environmental recommendations are made to achieve environmental protection. These recommendations are aimed at ensuring that the applicant maintains adequate control over the Project to:

- Minimise the extent of an impact during the life of the Project;
- Ensure appropriate restoration of areas affected by the Project; and
- Prevent long term environmental degradation.

The specific impact management objectives and outcomes for the Kubu Coal Mine include the following:

- Leave a safe and stable environment for both humans and animals and make their condition sustainable;
- Comply with local and national regulatory requirements;
- Maintain and minimise impacts to the ecosystem within the study area;
- Re-establishment of the pre-mining land capability to allow for a suitable post mining land use;
- Maintain and minimise impacts to the functioning floodplain and waterbodies within the area;
- Implement progressive rehabilitation measures where possible (i.e. contractors camps and areas used during the construction phase);
- Prevent soil, surface water and groundwater contamination;
- Comply with the relevant local and national regulatory requirements; and
- Maintain and monitor the rehabilitated areas.

16 Item 3(m): Final Proposed Alternatives

The layout for the Kubu Coal Mine was informed based on environmental studies, especially the wetland delineation, 1:100 year floodline determination and ecological sensitivities. The environmental baseline is discussed in Section 9, with the alternatives for the Project discussed in Section 8.1. Where impacts cannot be avoided, mitigation and management measures have been provided.

17 Item 3(n): Aspects for Inclusion as Conditions of Authorisation

The following aspects must be included as part of the conditions for authorisation:

- All mitigation measures provided in this report must be implemented;
- Environmental monitoring must take place as recommended;
- Implementation of the SLP commitments to ensure the social benefits are achieved;
- A groundwater numerical model specific to the Kubu Coal Mine must be compiled to model potential contamination plumes and the drawdown impact associated with the operations, as well as to determine potential decant locations, if any, and rates post closure;
- Groundwater boreholes to be impacted upon must be determined through the numerical model to be undertaken specific for Kubu Coal Mine. The event that these boreholes belong to adjacent landowners and are impacted on by mining activities, agreements must be put in place with the landowner if a loss of a borehole occurs and/or deterioration in water quality;
- A grievance mechanism must be implemented;
- A Water Use Licence must be granted by the relevant competent authority prior to any activities taking place on site;
- A detailed water balance and conceptual SWMP must be compiled and submitted to the DWS prior to the construction phase being undertaken;
- A blasting and vibrations assessment must be undertaken to establish the required charges to be utilised. Agreements with land occupiers to the west of the Project area, adjacent to Koert Louw Zyn Pan, must be established and these occupiers must be informed of any blasting activities. Charges used must take into account the location of these occupiers;
- A nursery and biodiversity management plan[20] must be developed and implemented;
- Overburden and ROM coal from the open pit must undergo waste classification to confirm the characteristics of the materials within 180 days of mining commencement, with the overburden dump and ROM tip area lined according to the applicable legislation;
- A performance assessment will be undertaken on an annual basis by an independent consultant; and
- The Rehabilitation Plan and closure cost assessment must be updated and submitted to the DMR as per the legislative requirements (annually).

[20] Due to the establishment of the conservation and nursery areas, an offset strategy is not deemed to be required. Should the biodiversity management plan identify the need for an offset strategy, this will be included.

18 Item 3(o): Description of any Assumptions, Uncertainties and Gaps in Knowledge

This section highlights the assumptions, uncertainties, limitations and knowledge gaps relevant to the various specialist studies undertaken. The assumptions, uncertainties and limitations for the specialist studies are discussed separately below, with the assumptions for the EIA including the following:

- No Visual Impact Assessment was undertaken for this Project. Although visual impacts are anticipated, particularly for land occupiers adjacent to the farm Koert Louw Zyn Pan, these visual impacts were not quantitatively assessed. This visual environment is anticipated to change significantly with the commencement of the Boikarabelo Coal Mine and the Kubu Coal Mine;
- No blasting and vibration assessment was undertaken. A blasting and vibration assessment will be required as the land occupiers to the west of Koert Louw Zyn Pan are within the 500 m blast radius. The blast and vibration assessment will be required to determine the potential impacts to the land occupiers and their dwellings, as well as to provide mitigation measures in terms of charge and stemming length; and
- A separate Noise Impact Assessment report was not compiled, although a noise specialist undertook the baseline monitoring, the dispersion modelling, impact assessment and provided the mitigation measures.

18.1 Air Quality Impact Assessment

The following assumptions and limitations were identified for the Air Quality Impact Assessment:

- PM_{10} and $PM_{2.5}$ data was not available to assess background levels of these pollutants at the proposed Project site and immediate environment;
- Data collected at the South African Weather (SAWS) Ambient Air Quality Station in Lephalale was assumed to be representative of background data;
- Dispersion modelling was not conducted for PM_{10} and $PM_{2.5}$. It is assumed that with mitigation measures implemented, the subsequent reduction seen in dust deposition rates will result in a decrease in the ambient levels of PM_{10} and $PM_{2.5}$; and
- Site-specific meteorological data were not available for assessment.

18.2 Fauna and Flora Impact Assessment

The field work for the Fauna and Flora Impact Assessment was conducted over one day on 9 March 2015 during which time the vegetation communities were delineated. As a consequence, it is possible that some plant and especially animal species, within these communities, were not recorded on site.

18.3 Aquatic Impact Assessment

The methods outlined in the Aquatic Impact Assessment assume that aquatic ecology within the associated river courses is evenly distributed.

18.4 Wetland Impact Assessment

The limitations and assumptions for the Wetlands Impact Assessment include the following:

- The field visit was completed on 9 of March 2015 and was limited to a single day. It is likely that not all plant species present on site were identified, due to time constraints;
- The health assessment of the Limpopo River is representative but was conducted only for the small section of the river associated with the site; and
- It is imperative to note that any changes to the wetlands systems within the study boundary after field work had commenced were not considered for this assessment. Any discrepancies as a result of this have not been regarded.

18.5 Surface Water Impact Assessment

The following assumptions and limitations are applicable to the Surface Water Impact Assessment:

- The baseline assessment was based predominantly on desktop information from the existing reports and DWS data base;
- Historical water quality data was obtained from the previous existing reports whilst sampling was done on 6 May 2015 to assess the current water quality status;
- There are no DWS stream flow gauges along the Limpopo River in close proximity to the proposed Project site. However, the surface water assessment study was completed with the knowledge that the proposed Kubu Coal Mine will not be abstracting any water from the Limpopo River. All raw and potable water will be sourced from the Boikarabelo Coal Mine to the surface infrastructure area at the Project site;
- The 1:100 year floodline for the section of the Limpopo River within which the Project area was obtained from the Limpopo River floodline report undertaken by PBA international, January 2010;
- No Storm Water Management Plan or water balance was completed as part of the Surface Water Impact Assessment; and
- The Surface Water Impact Assessment was done based on the provided mine layout plans and the proposed mine activities, changes on the mine plans after completion of this report will not form part of the impact assessment.

18.6 Groundwater Impact Assessment

The following assumptions and limitations were applied as part of the Groundwater Impact Assessment:

- Only two sites were sampled in 2015 for water quality analysis, however historical water sampling data was used supplied by the client and sourced from the adjacent Boikarabelo Coal Mine;
- No borehole drilling programme or aquifer testing programme was undertaken and therefore the assumptions were made that the aquifers and aquifer properties are similar to previous investigation results. No aquifer parameters such as transmissivity and conductivity were measured;
- The Boikarabelo Coal Mine AMD study was used to estimate the acid generation potential, acid neutralisation potential and metal leachability of the coal and waste material; and
- The Boikarabelo Coal Mine numerical model was utilised to simulate dewatering impacts associated with Kubu Coal Mine. A numerical model specific to Kubu Coal Mine should be developed prior to mining activities commencing.

18.7 Noise Assessment

The assumptions and limitations associated with the Noise Assessment include:

- Only daytime scenarios were modelled for the construction phase as it is assumed that construction activities will only be undertaken during daytime hours (06:00-18:00);
- Blasting was not assessed according the A-weighted pressure due to its impulsive nature as well as its higher decibel levels in the low frequency range. Noise dispersion modelling was therefore not performed for the blasting activities. Blasting is assessed according to its linear pressure (dBLin) instead of its A-weighted pressure (dBA) to establish the overpressure strength of the blast; and
- The resulting noise contours represent worst case (unmitigated), L_{Aeq} at any receiver located 360 degrees in the horizontal plane around the noise sources. The noise modelling software is limited to calculating the predominant wind direction (or downwind conditions of propagation) per single receptor only. Calm wind conditions have therefore been included in the model due to the number of surrounding receptors. Thus, the noise dispersion plots do not represent a typical seasonal scenario in the predominant wind direction but rather a yearly average of the area's meteorological conditions in all directions.

18.8 Rehabilitation and Closure

The following assumptions have been made in the determination of the year one financial provision and compilation of the Rehabilitation Plan:

- The Storm Water Management Plan, to be developed by Kubu Coal Mine, will take into consideration rehabilitation. Storm water management has therefore not be included in the Rehabilitation Plan;
- The Rehabilitation Plan and financial provision calculations should be revised and updated annually to take into account further developments;
- The closure cost assessment was a desktop study which included calculating the financial provision for Kubu Coal Mine based on areas and volumes calculated by Digby Wells and based on information provided by WOC;
- A contingency of 10% has been allowed since there is always the possibility that areas have been left out of the liability assessment or that areas may have been overlooked and is per the DMR guidelines;
- A project management fee of 6% has also been added as per the DMR guidelines;
- The width on the conveyor belt was assumed to be 2.5 m with a height of 5 m;
- It was assumed that only 60% of the ROM tip and crushing area will be occupied by steel buildings or structures;
- The cut-off drain was assumed to be 2.5 m wide;
- Access road were assumed to have a width of 6 m and haul roads a maximum width of 11 m; and
- The full planned pit area is included in the calculation.

19 Item 3(p): Reasoned Opinion as to whether the Proposed Activity should or should not be Authorised

19.1 Item 3(p)(i): Reasons why the Activity should be Authorised or not

As indicated in Section 12, the potential significant (moderate or major) impacts associated with the Kubu Coal Mine relate to the loss of vegetation, particularly Red Data and Protected tree species *A. erioloba* and *C. imberbe*, potential damage or destruction to unidentified heritage resources, population influx and related impacts and the cone of depression associated with the dewatering of the aquifers to allow for safe mining activities to be undertaken.

The loss of SSC during site clearing is inevitable. The establishment of a nursery and biodiversity land management plan for protected and Red Data species will compensate for the loss of species during site clearance, as well as ensure the Project area can be successfully rehabilitated post operation.

The numerical model developed for the adjacent Boikarabelo Coal Mine was utilised to determine the potential drawdown impacts associated with the Kubu Coal Mine. A numerical model for Kubu Coal Mine must be developed prior to the establishment of the open pit to confirm potential impacts. The cone of depression, which was modelled based on the numerical model developed for the adjacent Boikarabelo Coal Mine, will occur due to dewatering of the open pit which is a necessity to allow for safe mining conditions. The cone of depression will lower water tables around the open pit, with the maximum extent of drawdown is predicted to be 2.8 km to the east, based on the Boikarabelo Coal Mine numerical model. The drawdown will impact on groundwater users as pumping heads will increase and boreholes potentially run dry depending on their location. This impact will be more severe once the Boikarabelo Coal Mine and Kubu Coal Mine operate concurrently, however the cone of depression is not anticipated to reach the Limpopo River.

The commencement of the Kubu Coal Mine may have several positive impacts, particularly regarding the Social and Labour Plan (SLP) commitments to be undertaken by WOC, once the SLP has been approved by the Local Municipality. The SLP commitments will include skills upliftment and training of the local communities, prioritised employment, Local Economic Development (LED) initiatives and services and infrastructure establishment and upgrades. Employment and education have been raised as concerns by stakeholders from local communities and the commencement of the Project will aid in addressing such concerns.

In addition, there is local and global demand for coal and the Kubu Coal Mine will produce, via beneficiation at the adjacent Boikarabelo Coal Mine, 3 million tonnes of product coal for the local market and 3 million tonnes of product coal for the international market. This will contribute to the local, regional and national GDP through taxes and loyalties.

The Kubu Coal Mine is likely to result in environmental and social impacts; however these impacts are predominantly of minor (negative) significance. All of the identified potential impacts can be mitigated and managed to ensure their significance are reduced, while ensuring that the positive impacts are realised. Furthermore, the Waterberg SDF has identified the mining zone around Steenbokpan as Potential Development Area 1 for future mining activities; Kubu Coal Mine falls within the identified mining zone and aligns with the municipality’s SDF.

19.2 Item 3(p)(ii): Conditions that must be Included in the Authorisation

19.2.1 Specific Conditions to be included into the Compilation and Approval of EMPR

The following aspects must be included as part of the conditions for authorisation:

- All mitigation measures provided in this report must be implemented;
- Environmental monitoring must take place as recommended;
- Implementation of the SLP commitments to ensure the social benefits are achieved;

- A groundwater numerical model specific to the Kubu Coal Mine must be compiled to model potential contamination plumes and the drawdown impact associated with the operations, as well as to determine potential decant locations, if any, and rates post closure;
- Groundwater boreholes to be impacted upon must be determined through the numerical model to be undertaken specific for Kubu Coal Mine. The event that these boreholes belong to adjacent landowners and are impacted on by mining activities, agreements must be put in place with the landowner if a loss of a borehole occurs and/or deterioration in water quality;
- A grievance mechanism must be implemented;
- A detailed water balance and conceptual SWMP must be compiled and submitted to the DWS prior to the construction phase being undertaken;
- A blasting and vibrations assessment must be undertaken to establish the required charges to be utilised. Agreements with land occupiers to the west of the Project area, adjacent to Koert Louw Zyn Pan, must be established and these occupiers must be informed of any blasting activities. Charges used must take into account the location of these occupiers;
- A nursery and biodiversity management plan[21] must be developed and implemented;
- Overburden and ROM coal from the open pit must undergo waste classification to confirm the characteristics of the materials within 180 days of mining commencement, with the overburden dump and ROM tip area lined according to the applicable legislation;
- A performance assessment will be undertaken on an annual basis by an independent consultant; and
- The Rehabilitation Plan and closure cost assessment must be updated and submitted to the DMR as per the legislative requirements (annually).

19.2.2 Rehabilitation Requirements

A Rehabilitation Plan (Appendix M) has been compiled for the Kubu Coal Mine, as required by the MPRDA. A Rehabilitation Plan is an important planning tool designed to assist in preventing, minimising or mitigating adverse long-term environmental and social impacts caused by a proposed project, as well as to create a self-sustaining ecosystem and to ensure the optimal management of rehabilitation issues that may arise. The overall rehabilitation objectives, and requirements, for the Kubu Coal Mine are as follows:

- Leave a safe and stable environment for both humans and animals and make their condition sustainable;

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[21] Due to the establishment of the conservation and nursery areas, an offset strategy is not deemed to be required. Should the biodiversity management plan identify the need for an offset strategy, this will be included.

- Comply with local and national regulatory requirements;
- Maintain and minimise impacts to the ecosystem within the study area;
- Re-establishment of the pre-mining land capability to allow for a suitable post mining land use;
- Maintain and minimise impacts to the functioning floodplain and waterbodies within the area;
- Implement progressive rehabilitation measures where possible (i.e. contractors camps and areas used during the construction phase);
- Prevent soil, surface water and groundwater contamination;
- Comply with the relevant local and national regulatory requirements; and
- Maintain and monitor the rehabilitated areas.

20 Item 3(q): Period for which the Environmental Authorisation is Required

The timeframes associated with the Project, for which environmental authorisation is required, is outlined in Table 20-1. Environmental authorisation is required for the extent of the Mining Right, which is 30 years.

Table 20-1: Project Timeframe

Project Phase / Activity	Date	Time Period
Construction	2019 - 2020	2 years
Operational / Mining	Quarter 3, 2020	30 years
Decommissioning	2048	3 Years

21 Item 3(r): Undertaking

It is confirmed that an undertaking is provided in Part B, Section 13 of the EMPr and is applicable to the EIA and EMPr sections of this report.

22 Item 3(s): Financial Provision

The financial provision assessment focused on the proposed mining activities and was calculated by means of the DMR's standard method for assessment of mine closure. Activities incorporated into the calculation included the demolition and management of physical infrastructure and the rehabilitation of the areas affected by mining activities.

The areas for the mine which needed to be included in the current assessment were provided to Digby Wells by the applicant. The financial provision for the Kubu Coal Mine for year one is **R 11 768 408**. The total cost includes contingencies of 10%, Preliminary and General of 12% and is inclusive of VAT at 14%. The financial provision for the closure of Kubu Coal Mine has been included in Appendix M and makes the assumption that all infrastructure will be demolished; the final land use for the site will be determined in consultation with the local municipality and affected communities.

22.1 Item 3(s)(i): Explain how the Aforesaid Amount was Derived

The Rehabilitation Plan and Closure Cost Assessment is provided in Appendix M. The "*Guideline Document for the Evaluation of the Quantum of Closure-Related Financial Provision Provided by a Mine*" was used to assess the applicant's environmental liability at the pre-feasibility stage. The DMR Guideline format makes use of a set template for which defined rates and multiplication factors are used. The multiplication and weighting factors which ultimately define the rate to be used are determined by, amongst others, the topography, the classification of the mine according to mineral mined, the risk class of the mine and its proximity to build up or urban areas.

The DMR rates were published in 2005 and, due to inflation, are no longer accurate. The 2013 Master Rates have been updated using an inflationary figure of 6.1% (Average CPI for 2014) and 4.6% (Average CPI for 2015) was then added to the 2015 rates to reflect the current 2016 rates. The closure liability for year one is detailed in Table 22-1.

Table 22-1: Closure Liability for Year One of the Proposed Kubu Coal Mine

No.:	Description: Class C (Low Risk)	Unit:	Quantity	Master rate	Amount (Rands)
2 (A)	Demolition of steel buildings & Structures	m^2	16421.18	187.53	R 3 079 480
2 (B)	Demolition of reinforced concrete buildings & structures	m^2	5797.27	276.36	R 1 602 113
3	Rehabilitation of access roads	m^2	49200.00	33.56	R 1 651 341
6	Opencast rehabilitation including final voids & ramps3	ha	4.00	196 610.70	R 786 443
8 (A)	Rehabilitation of overburden & spoils	ha	3.00	131 073.80	R 393 221
8 (C)	Rehabilitation of processing waste deposits & evaporation ponds (acidic, metal-rich waste)	ha	0.07	474 155.54	R 30 944
10	General surface rehabilitation	ha	2.22	103 832.56	R 230 700
11	River diversions	ha	0.00	103 832.56	R 0
12	Fencing	m	0.00	118.44	R 0
13	Water management**	ha	4.00	39 480.06	R 157 920
14	2 to 3 years of maintenance & aftercare	ha	14.21	13 818.02	R 196 314
					R 8 128 476
				(Sum of items 1 to 15 Above)	
			Sub Total 1 Weighting factor 2 (step 4.4)	1.05	**R 8 534 900**
			Preliminary and General	12% of Subtotal 1	R 975 417
			Contingency	10% of Subtotal 1	R 812 848
	Sub Total 2				**R 10 323 165**
				(Subtotal 1 plus sum of management & administrative items, 1 to 6 above)	
				VAT (14%)	R 1 445 243
				Grand Total for YEAR 1 (Subtotal 2 plus VAT)	**R 11 768 408**

22.2 Item 3(s)(ii): Confirm that this Amount can be Provided for from Operating Expenditure

WOC confirms that the LoM financial provision estimate has been provided for within the operating expenditure of the Kubu Coal Mine Project.

WOC confirms that on the granting of the Mining Right a financial guarantee will be provided for the first year financial provision.

23 Item 3(t): Deviations from the Approved Scoping Report and Plan of Study

23.1 Item 3(t)(i): Deviations from the Methodology used in Determining the Significance of Potential Environmental Impacts and Risks

There were no deviations from the methodology proposed in the Scoping Report and plan of study.

23.2 Item 3(t)(ii): Motivation for the Deviation

No deviations were undertaken from the acknowledged Scoping Report submitted to the DMR.

24 Item 3(u): Other Information required by the Competent Authority

To ensure compliance with the provisions of Sections 24(4)(a) and (b) read with Section 24 (3) (a) and (7) of the NEMA, the EIA report must include the information provided in the following chapters.

24.1 Item 3(u)(i)(1): Impact on the Socio-Economic Conditions of any Directly Affected Person

The commencement of the Kubu Coal Mine is likely to have positive and negative social impacts for the region. Positive impacts are associated with the increased capital expenditure, the creation of jobs and the positive impacts associated with training and LED initiatives as part of the SLP. The potential negative social impacts associated with the Project includes population influx as job seekers move to the area in seek of work and better living standards; this population influx has a series of related impacts such as pressure on resources and services, increase and expansion of informal settlements and potential increase in crime and communicable diseases. These impacts, both positive and negative, are likely to be regional impacts.

The Project area is currently utilised for game farming and hunting and is currently a viable land use, although the benefits of the hunting activities are limited in their extent as the farm employs a very limited number of personnel. In addition, Resgen South Africa (Pty) Ltd is in the process of purchasing the Koert Louw Zyn Pan property which will limit the impact to the land owners as the current land use will no longer be a form of income; it is imperative that the agreement for Koert Louw Zyn Pan clearly defines the responsible party for ensuring the workers are included or compensated appropriately for the change on land use and loss of employment. There are land occupiers/farm workers living along the western boundary of the Project site which will be impacted by the blasting activities as they are located within 500 m of the proposed open pit. A blasting and vibrations assessment must be undertaken to determine the potential impacts on the land occupiers, as well as to determine the appropriate charge and stemming length to mitigate potential impacts. Should the blasting and vibration assessment deem that the land occupiers are at risk, formal agreements must be concluded with the farm landowner.

The adjacent land occupiers may be impacted due to nuisance impacts associated with the Kubu Coal Mine, such as a reduction in ambient air quality due to dust generation and emissions, as well as noise impacts. The noise modelling indicated that the noise levels generated by activities at the Kubu Coal Mine will not exceed the baseline noise levels. Similarly, with the implementation of the mitigation measures, the dust generation will not exceed the NAAQS and NDCR limits at the receptors for PM and dust fallout respectively.

24.2 Item 3(u)(i)(2): Impact on any National Estate Referred to in Section 3(2) of the National Heritage Resources Act.

A comprehensive AIA was undertaken in 2009 and submitted to SAHRA, following which SAHRA provided comment. The mitigation measures provided in this report must be undertaken and include Phase 2 shovel test pits and mapping and test excavations. The Phase 2 mitigation measures will ensure that there are no impacts to the identified heritage resources.

The Project area also contains moderate to high palaeontological sensitivity. The Project area is therefore clearly located within a rich heritage landscape with great temporal depth and there is the possibility that unidentified heritage resources may be uncovered, damaged or destroyed during site clearing activities. Boikarabelo Coal Mine has a comprehensive CFP developed especially for the area. It is recommended that this CFP be implemented during site clearing activities, or alternatively a CFP specific to Kubu Coal Mine must be developed and implemented.

25 Item 3(v): Other Matters Required in Terms of Sections 24(4)(a) and (b) of the Act

This EIA report provides the competent authority with a detailed investigation of the activities to be undertaken a part of the project and their potential impacts. In addition, alternatives for the project have been discussed and assessed and no other matters are required in terms of Sections 24(4)(a) and (b) of the NEMA.

Part B: Environmental Management Programme Report

1 Item 1(a): Details of the EAP

It is confirmed that the details of the EAP have been provided in Part A, Section 2.1 of this report.

2 Item 1(b): Description of the Aspects of the Activity

It is confirmed that the baseline environment that may be impacted by the activities is detailed and discussed in Part A, Section 9 of this report.

3 Item 1(c): Composite Map

A composite plan for the proposed Kubu Coal Mine area is illustrated in Plan 24, Appendix A

4 Item 1(d): Description of Impact Management Objectives including Management Statements

4.1 Item 1(d)(i): Determination of Closure Objectives

The overall rehabilitation objectives, and requirements, for the Kubu Coal Mine have been developed with the baseline environment in mind and are as follows:

- Leave a safe and stable environment for both humans and animals and make their condition sustainable;
- Comply with local and national regulatory requirements;
- Maintain and minimise impacts to the ecosystem within the study area;
- Re-establishment of the pre-mining land capability to allow for a suitable post mining land use;
- Maintain and minimise impacts to the functioning floodplain and waterbodies within the area;
- Implement progressive rehabilitation measures where possible (i.e. contractors camps and areas used during the construction phase);
- Prevent soil, surface water and groundwater contamination;
- Comply with the relevant local and national regulatory requirements; and
- Maintain and monitor the rehabilitated areas.

4.2 Item 1(d)(ii): The Process for Managing any Environmental Damage, Pollution, Pumping and Treatment of Extraneous Water or Ecological Degradation as a Result of undertaking a Listed Activity

4.2.1 Ecological Degradation

Listed and specified activities associated with the Kubu Coal Mine will result in ecological degradation and environmental damage and pollution. The potential impacts associated with such activities have been identified and assessed for each environmental aspect in Sections 10.1 to 10.3. Mitigation measures have been provided to mitigate the potential impacts associated with the Project's activities to reduce the significance of such impacts. In addition, monitoring programmes have been provided in Section 9 to monitor potential impacts which will allow alternative mitigation measures to be implemented if necessary.

The predominant impact of significance that may result in ecological degradation is the clearing of vegetation and especially Red Data and Protected tree species, such as *A. erioloba* and *C. imberbe*. Although the loss of protected species is inevitable during the site clearing, which leads to the loss of habitat and biodiversity, a nursery must be established to be used during rehabilitation. A biodiversity land management plan is also recommended.

There is also a potential for the contamination of surface water resources and resultant impact to aquatic ecology due to soil erosion, dirty water runoff and possible seepage. The impacts are considered to be minor (negative) but will cause ecological degradation should they occur. The implementation of a Storm Water Management Plan, as well as the lining of the ROM tip area, overburden dump and PCDs will ensure that damage or pollution to the environment is managed and mitigated.

4.2.2 Process for Managing Ecological Degradation

An Emergency Response Plan has been developed by WOC and is summarised in this section. The Emergency Response Plan will be placed around the mine where it can be easily viewed and referenced for mine employees in the case of an emergency and will contain evacuation procedures and a list of emergency numbers. Potential emergencies include accidents, fires, hydrocarbon spillages and flooding.

Should the emergency have potential to affect surrounding communities, the communities will be alerted via alarm signals or contacted in person. The surrounding community will be informed prior to mining taking place, of the potential dangers and emergencies that exist, and the actions to be taken in such emergencies.

Communication is vital in an emergency and thus communication devices, such as mobile phones, radios, or telephones, will be available around the mine. A checklist of emergency response participants must be consulted and the relevant units notified. In this case, many of the emergency services will be sourced from Lephalale and neighbouring towns. The checklist includes:

- Fire department;
- Police;
- Emergency health services such as ambulances, paramedic teams and poison centres;
- Hospitals, both local and for evacuation for specialist care;
- Public health authorities;
- Environmental agencies, especially those responsible for air, water and waste;
- Public works and highway departments; and
- Public information authorities and media organisations.

All emergency response procedures will be implemented on the initiation of the construction phase. All employees of the Kubu Coal Mine will be trained in these procedures as part of the mine induction process. WOC will ensure that all emergency numbers are located in various locations around the site and these locations are known to all employees for easy accessibility in the event of an emergency.

4.2.2.1 Emergency Situations

The sections below describe the potential emergencies that could occur.

4.2.2.1.1 Accidents

In the case of a medical accident or problem, a first aid kit will be available on the mine. A checklist of emergency response participants must be consulted and the relevant units notified. In this case, many of the emergency services will be sourced from Lephalale.

4.2.2.1.2 Fire

Veld fires and fires resulting from other sources must be handled with extreme caution. Fire extinguishers will be placed around the mine. The procedure in the case of fires includes the following:

- The alarm will be activated to alert occupants of the mine in the event of a fire;
- In the event of a small fire the fire extinguishers placed around the mine should be used to contain and extinguish the fire;
- In the event of a large fire, the local area council's fire department will be consulted; and
- All staff will receive training in response to a fire emergency on site.

4.2.2.1.3 Hydrocarbon Spillages

Hydrocarbons such as diesel, petrol, and oil will be kept on site as fuel for the mine machinery. Hydrocarbons will be stored within bunded and hard park areas. In the event of a spillage, procedures must be put into place to ensure that there are minimal impacts to the surrounding environment. Mitigation measures to prevent the occurrence of a spill from taking place are provided in Table 11-1, Part B. However, in the event of a hydrocarbon spillage, the following must be implemented:

- In the event of a small spillage, the soil will be excavated and treated;
- In the event of a large spillage, adequate emergency equipment for spill containment or collection such as additional supplies of booms and absorbent materials will be available and if required, a specialised clean-up crew will be called in to decontaminate the area. The DWS will be informed of any spills in accordance with Section 20 of the NWA; and
- After a major spill, water quality samples of any water sources within 500 m from the spill will be monitored for hydrocarbons for the next three months on a monthly basis and further remediation recommended based on the results thereof.

4.2.2.1.4 Flooding

There is potential for flooding during the rainy season, but particularly November to January when severe thunderstorms can occur. This could result in a large volume of water flowing downstream and could cause major damage to equipment and endanger the lives of employees on site. Heavy rainfall could also cause the PCDs to overflow and could flood mine workings. If this water leaves the sites it will enter water resources on site and cause contamination. Procedures must be put in place to ensure that there is a quick response to these events and damage is kept to a minimum. These procedures include:

- DWS's flood warning system should be reviewed annually;
- The use of emergency pumps will occur if the water floods the pits, where it may be exposed to contamination; and
- Mine management must be made aware of any such event so they can take appropriate action to ensure production losses are kept to a minimum.

4.3 Item 1(d)(iii): Potential Risk of Acid Mine Drainage

The potential for AMD to occur was derived from the Boikarabelo Geochem and AMD study results (Digby Wells, 2014). Kubu Coal Mine is located adjacent to the Boikarabelo Coal Mine and within the Waterberg Coalfield, bounded by the Zoetfontein fault in the north and the Eenzaamheid fault in the south. The geology of both sites consists of barren sediments and overlies the intercalated bright and dull coal zones, sandstone and carbonaceous mudstone.

The environmental geochemical assessment (Digby Wells, 2014) was conducted to estimate the acid generation potential, acid neutralisation potential and metal leachability of the coal and waste material. The study was conducted based on the source term-pathway-receptor methodology prescribed in the DWS guidelines for impact prediction. The following conclusions were made with regards to the Boikarabelo Coal Mine AMD assessment and the leachable water qualities associated with the local geological horizons:

4.3.1 Coal Material

The coal material will be stockpiled for short periods on site before being crushed and transported to Boikarabelo Coal Mine for beneficiation. The duration of pollution development and potential AMD formation is thus short and can be mitigated to allow limited contamination. The AMD potential of the coal material is summarised as follows:

- The coal material has high pyrite content and smaller amounts of calcite and clay minerals. The pyrite content however, increases the iron and sulphur in the coal resulting in AMD formation once oxidation takes place;
- The coal material assessment showed 7 out of the 12 coal samples are potential acid generating (PAG) with 1 marginal case and 4 non-acid generating samples;
- The coal is classed as potentially acid generating with stockpiles potentially leading to AMD development and pollution of groundwater and surface water resources if not mitigated and managed; and
- The coal material shows the potential of metal leach with aluminium, cobalt, chromium, iron, manganese, nickel, lead, chlorine, sulphate and TDS leaching in concentrations above the recommended SANS drinking water guidelines.

4.3.2 Overburden and Interburden Material

Overburden and interburden will be stored on the overburden dump until such time as it will be used to backfill the open pit. Overburden will only be deposited on the overburden dump for the first 6 years of operation, thereafter concurrent rehabilitation will be undertaken; excavated overburden and interburden will be used to backfill mined out strips. The AMD potential of the overburden and interburden material is summarised as follows:

- The overburden is highly weathered material with a high neutralising capacity;
- The overburden was classified as non-potentially acid generating with a high buffering capacity;
- The highly weathered nature of the overburden shows low concentrations of metals and salts due to weathering over time. However, arsenic may leach out above the recommended 0.01 mg per litre concentrations, with high concentrations of sulphate also leaching from the overburden;

- Interburden material has high pyrite content but, with the inclusion of dolomite and calcite in the mineralogy, has a high buffering capacity which allows the interburden to be classified as non-potentially acid generating with a low AMD risk;
- The underburden samples have a higher tendency for acid generation than the interburden and was classed as potentially acid generating; and
- Aluminium, cobalt, manganese, nickel, selenium and sulphate leach out in concentrations above the SANS 241:2011 standards.

4.4 Item 1(d)(iv): Steps taken to Investigate, Assess, and Evaluate the Impact of Acid Mine Drainage

Geochemical work undertaken for the Boikarabelo Coal Mine was utilised as it is assumed that the overburden and coal material is consistent across the Project area and adjacent Boikarabelo Coal Mine. The work undertaken in 2014 included static laboratory tests to determine the leachable concentrations using the standard Synthetic Precipitation Leachate Procedure (SPLP) in total concentration. Total Concentration Threshold (TCT) limits were subdivided into three categories as follows:

- TCT0 limits based on screening values for the protection of water resources, as contained in the Framework for the Management of Contaminated Land (DEA, March 2010);
- TCT1 limits derived from land remediation values for commercial/industrial land (DEA, March 2010); and
- TCT2 limits derived by multiplying the TCT1 values by a factor of 4, as used by the Environmental Protection Agency, Australian State of Victoria.

Leachable concentration was determined by following the standard United States Environmental Protection Agency (US EPA) SPLP methodology. The leachate concentrations were not determined as specified in the NEM:WA Regulations (2013) due to previous results used. Leachable Concentration Threshold (LCT) limits were subdivided into four categories as follows:

- LCT0 limits derived from human health effect values for drinking water, as published by the DWS, SANS, World Health Organization (WHO) or the US EPA;
- LCT1 limits derived by multiplying LCT0 values by a Dilution Attenuation Factor (DAF) of 50, as proposed by the Australian State of Victoria;
- LCT2 limits derived by multiplying LCT1 values by a factor of 2; and
- LCT3 limits derived by multiplying the LCT2 values by a factor of 4.

Waste was classified by comparison of the total and leachable concentration of elements and chemical substances in the waste material to TCT and LCT limits as specified in the

National Norms and Standards for Waste Classification and the National Norms and Standards for Disposal to Landfill as per Table 4-1.

Table 4-1: Waste Classification Criteria

Waste Type	Element or Chemical Substance Concentration	Disposal
0	LC > LCT3 **OR** TC > TCT2	Not allowed
1	LCT2 < LC ≤ LCT3 **OR** TCT1 < TC ≤ TCT2	Class A or Hh:HH landfill
2	LCT1 < LC ≤ LCT2 **AND** TC ≤ TCT1	Class B or GLB+ landfill
3	LCT0 < LC ≤ LCT1 **AND** TC ≤ TCT1	Class C or GLB- landfill
4	LC ≤ LCT0 **AND** TC ≤ TCT0 for metal ions and inorganic anions **AND** all chemical substances are below the total concentration limits provided for organics and pesticides listed	Class D or GLB- landfill

4.5 Item i(d)(v): Engineering or Mine Design Solutions to be Implemented to Avoid or Remedy Acid Mine Drainage

Based on the geochemistry work undertaken in 2014, the overburden and interburden material was classified as non-potentially acid generating and has high buffering capacity within the material, minimising the risk for AMD formation from the overburden dump. The ROM coal was classified as potentially acid generating and the iron and sulphur concentrations in the coal will result in AMD formation once oxidation takes place. The ROM coal will be stockpiled temporarily, however, before being crushed and transported via overland conveyor to the Boikarabelo Coal Mine. The short time frame associated with the stockpiling limits the potential for AMD generation.

However, the sampled materials indicated a Type 3 waste due to the total concentration of barium and arsenic concentrations above the TCT0 threshold values, which requires a Class C landfill design in accordance with Section 3(1) and 3(2) of the Norms and Standards for the Disposal of Waste to a Landfill. The use of a Class C liner at the ROM tip area and overburden dump will ensure that any potential contamination, including potential AMD, will not impact on water resources. An example of the Class C containment barrier requirements is illustrated conceptually in Figure 4-1.

In addition to the liner requirements, a Storm Water Management Plan will be implemented which will ensure all runoff water from the ROM tip area, infrastructure area and overburden dump will be diverted by a cut-off trench or drain to the PCDs on site.

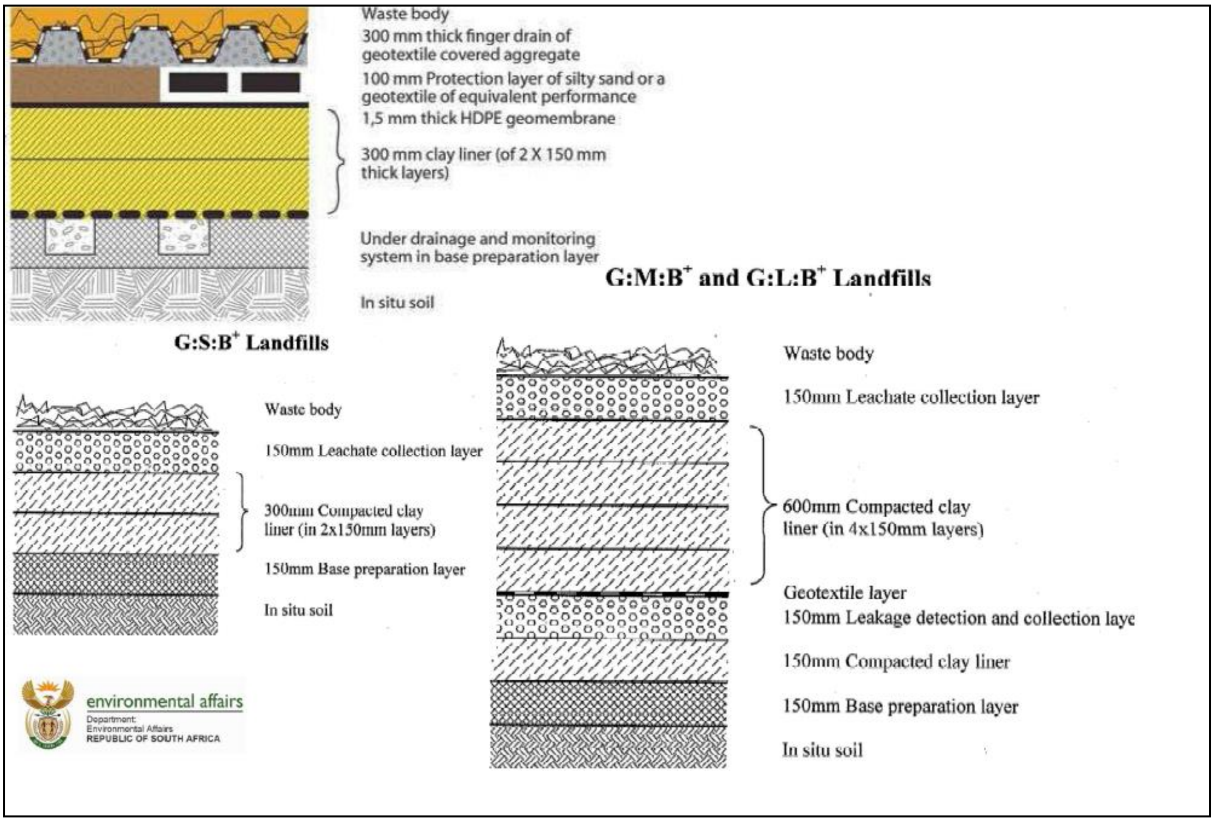

Figure 4-1: Class C Containment Barrier Requirements (DEA)

4.6 Item 1(d)(vi): Measures that will be put in place to Remedy any Residual or Cumulative Impact that may Result from Acid Mine Drainage

The overburden dump will be reclaimed in its entirety and used as backfill material for the open pit void. A Closure Plan must be compiled 15 years prior to closure and updated every 5 years. It is recommended that any underburden material, although anticipated to be minimal quantity, is placed on top of the more neutral and higher buffering capacity interburden material, and then the overburden material placed on top and capped. Monitoring of groundwater boreholes must continue post closure to monitor and identify any potential impacts following the rehabilitation process. The following studies are recommended to aid in the management of residual impacts following the operation of the Kubu Coal Mine:

- Development of a comprehensive numerical model specific for Kubu Coal Mine;
- Long term kinetic test work on ROM coal and overburden and interburden material to determine the potential of pollution and AMD potential over long-term periods; and
- Geochemical modelling to allow transient evaluation of the environmental geochemical process that will be associated with the open pit development and

pollution sources, as well as the simulation of any chemical mitigation options, such as lime dosage.

4.7 Item 1(d)(vii): Volumes and Rate of Water Use Required for the Mining, Trenching or Bulk Sampling Operation

The volumes and rate of water use required for the mining operations will be confirmed during the compilation of the IWULA and water balance for Kubu Coal Mine. It is anticipated that 1.5 million m^3 of water will be required per annum which will be sourced from the adjacent Boikarabelo Coal Mine and stored in water reservoirs within the infrastructure area.

4.8 Item 1(d)(viii): Has a Water Use Licence has been Applied for

An IWULA has not been submitted to the competent authority (DWS). An IWUL must be granted by the competent authority prior to any activities being undertaken on site.

5 Item 1(d)(ix): Impacts to be Mitigated in their Respective Phases

The proposed mitigation measures and its compliance with the relevant standards are presented in Table 5-1.

Table 5-1: Impacts to be Mitigated

Activities	Aspects Affected	Phase	Size and scale of disturbance	Mitigation Measures	Compliance with standards	Time period for implementation
Construction Phase						
Site Clearing	Air Quality	Construction Phase	Limited to the Project area and its immediate surrounds.	▪ Application of dust suppressants on haul roads; ▪ Only areas earmarked for infrastructure or the open pit must be cleared, no unnecessary site clearing must take place; ▪ ; and ▪ Speed limits must be enforced on site to limit dust generation (50 km/hr is recommended).	▪ National Dust Control Regulations (2013) of the National Environmental Management: Air Quality Act, 2004 (Act No.39 of 2004). ▪ Dust Monitoring Programme as per NEM:AQA.	▪ Prior to the commencement of the activity and for the duration of the project life.
	Soils	Construction Phase	Site specific	▪ The topsoil must be stripped by means of an excavator bucket and loaded onto dump trucks during site clearing. Topsoil must be stripped when the soil is dry and as per the guidelines in the Rehabilitation Plan; ▪ The topsoil berms and stockpiles must be kept to a maximum height of 5 m; ▪ Bush clearing contractors must only clear bushes and trees larger than 1 m. The remaining vegetation must be stripped with the top 0.3 m of topsoil to conserve as much of the nutrient cycle, organic matter and seed bank as possible; ▪ Compacted areas must be ripped to loosen the soil structure following site clearing and on any disturbed areas; ▪ Soil stockpiles must only be used for their designated final purposes; ▪ The stockpiles will be vegetated to reduce the risk of erosion, prevent weed growth and to reinstitute the ecological processes within the soil; ▪ Implement a Storm Water Management Plan; ▪ Should erosion form on cleared areas or topsoil berms, corrective actions, such as erosion berms, must be implemented to minimise any further erosion from taking place; ▪ Topsoil must be sourced and replaced and shaped to reduce the recurrence of erosion should any erosion occur; and ▪ Only the designated access routes must be used to reduce any unnecessary compaction.	▪ Chamber of Mines Guidelines. ▪ Storm Water Management Plan. ▪ DWS Best Practice Guideline G1: Stormwater Management. ▪ DWS Best Practice Guidelines A5. Water Management for Surface Mines. ▪ Soil Stripping Guideline. ▪ Rehabilitation Plan. ▪ MPRDA Regulation 56(1) to (8); soil pollution and erosion control. ▪ Conservation of Agricultural Resources Act, 1983 (Act No. 43 of 1983).	▪ During Construction Phase
	Fauna and Flora	Construction Phase	551.37 ha	▪ Only demarcated operational areas must be cleared of vegetation; ▪ All protected tree species destroyed during bush clearing must be recorded for replacement purposes	▪ Conservation of the environment as outlined in the National Environmental Management: Biodiversity Act, 2004 (Act No. 10 of 2004) ▪ South African National Biodiversity Index.	▪ Prior to and during the Construction Phase

Activities	Aspects Affected	Phase	Size and scale of disturbance	Mitigation Measures	Compliance with standards	Time period for implementation
				during rehabilitation; ▪ A nursery must be established on site; and ▪ A Biodiversity land management plan must be implemented.	▪ Alien Invasive Management Plan. ▪ Rehabilitation Plan.	
	Aquatics	Construction Phase	Local	▪ Establish silt traps within clean water channels; ▪ Only areas earmarked for infrastructure or the open pit must be cleared, no unnecessary site clearing must take place; ▪ Disturbed areas adjacent to the required cleared areas must be rehabilitated and vegetation established; ▪ Soils adjacent to the river/wetlands that have been compacted must be loosened to allow for germination of vegetation; ▪ Temporary diversion trenches and berms must be constructed to convey runoff to temporary trenches; ▪ Water management measures must be included in a SWMP and the IWWMP.	▪ National Water Act, 1998 (Act No. 36 of 1998). ▪ Rehabilitation Plan. ▪ DWS Best Practice Guideline G1: Stormwater Management. ▪ DWS Best Practice Guidelines A5. Water Management for Surface Mines.	▪ Prior to and during the Construction Phase
	Surface Water	Construction Phase	Local	▪ Implement a Storm Water Management Plan; ▪ Corrective actions, such as erosion berms, must be implemented to minimise any further erosion from taking place should any erosion occur; ▪ All runoff emanating from the dirty water areas must be diverted through a silt trap prior to entering the PCD; ▪ Application of dust suppressants on haul roads; and ▪ Only areas earmarked for infrastructure or the open pit must be cleared, no unnecessary site clearing must take place.	▪ Storm Water Management Plan according to the DWS Best Practice Guideline G1: Storm Water Management. ▪ DWS Best Practice Guidelines A5. Water Management for Surface Mines and GN 704. ▪ Surface Water Monitoring Programme according to DWS Best Practice Guidelines G3. Water Monitoring Systems.	▪ Prior to and during the Construction Phase
	Groundwater	Construction Phase	Limited	▪ Rehabilitate disturbed areas once construction has concluded; and ▪ Only the designated access routes must be used to reduce any unnecessary compaction.	▪ National Water Act, 1998 (Act No. 36 of 1998)	▪ Throughout Construction Phase
	Noise	Construction Phase	Only extending as far as Project area boundary	▪ Restricting construction activities to daylight hours (06:00 to 18:00); ▪ Construction machinery, equipment and vehicles must be serviced to the designed requirements of the machinery/vehicles to ensure noise suppression mechanisms are effective e.g. installed exhaust mufflers; and ▪ Switching off equipment when not in use.	▪ National Noise Control Regulations, SANS 10103:2008.	▪ Throughout Construction Phase
	Heritage	Construction	National	▪ Phase 2 Mapping and Test Excavations for heritage sites: PGS002, PGS008, PGS015, PGS036,	▪ Section 34 to 37 of the National Heritage Resources Act, 1999 (Act No. 25 of 1999)	▪ Prior to and during site clearing

Activities	Aspects Affected	Phase	Size and scale of disturbance	Mitigation Measures	Compliance with standards	Time period for implementation
	Resources	Phase		PGS037, PGS039 and PGS044; ▪ Phase 2 Shovel Test Pit for heritage sites: PGS004, PGS005 and PGS014; and ▪ Implementation of the Boikarabelo Coal Mine CFP, or the development and implementation of CFP specific to Kubu Coal Mine.		
Infrastructure Area	Air Quality	Construction Phase	Limited to the Project area and its immediate surrounds.	▪ Application of dust suppressants on haul roads; ▪ Only areas earmarked for infrastructure must be cleared, no unnecessary site clearing must take place; ▪ ; and ▪ Speed limits must be enforced on site to limit dust generation (50 km/hr is recommended).	▪ National Dust Control Regulations (2013) of the National Environmental Management: Air Quality Act, 2004 (Act No.39 of 2004). ▪ Dust Monitoring Programme as per NEM:AQA.	▪ Prior to the commencement of the activity and for the duration of the project life.
	Groundwater	Construction Phase	Limited	▪ Rehabilitate disturbed areas once construction has concluded; and ▪ Only the designated access routes must be used to reduce any unnecessary compaction.	▪ National Water Act, 1998 (Act No. 36 of 1998). ▪ Rehabilitation Plan.	▪ Throughout Construction Phase
	Noise	Construction Phase	Only extending as far as Project area boundary	▪ Restricting rehabilitation activities to daylight hours (06:00 to 18:00); ▪ Construction machinery, equipment and vehicles must be serviced to the designed requirements of the machinery/vehicles to ensure noise suppression mechanisms are effective e.g. installed exhaust mufflers; and ▪ Switching off equipment when not in use.	▪ National Noise Control Regulations, SANS 10103:2008.	▪ Throughout Construction Phase
Topsoil Berm	Air Quality	Construction Phase	Limited to the Project area and its immediate surrounds.	▪ Application of dust suppressants on haul roads; ▪ The topsoil berm must be vegetated; and ▪ The drop heights at loading and tipping points for soils must be minimised and reduced as far as practically possible.	▪ National Dust Control Regulations (2013) of the National Environmental Management: Air Quality Act, 2004 (Act No.39 of 2004). ▪ Dust Monitoring Programme as per NEM:AQA.	▪ Prior to the commencement of the activity and for the duration of the project life.
	Soils	Construction Phase Operational Phase	Site specific	▪ The topsoil must be stripped by means of an excavator bucket and loaded onto dump trucks during site clearing. Topsoil must be stripped when the soil is dry and as per the guidelines in the Rehabilitation Plan; ▪ The topsoil berms must be kept to a maximum height of 5 m; ▪ Bush clearing contractors must only clear bushes and trees larger than 1 m. The remaining vegetation must be stripped with the top 0.3 m of topsoil to conserve as much of the nutrient cycle, organic matter and seed bank as possible; ▪ Compacted areas must be ripped to loosen the soil	▪ Chamber of Mines Guidelines. ▪ Storm Water Management Plan. ▪ DWS Best Practice Guideline G1: Stormwater Management. ▪ DWS Best Practice Guidelines A5. Water Management for Surface Mines. ▪ Soil Stripping Guideline. ▪ Rehabilitation Plan. ▪ MPRDA Regulation 56(1) to (8); soil pollution and erosion control. ▪ Conservation of Agricultural Resources Act, 1983 (Act No. 43 of 1983).	▪ During Construction Phase and throughout the life of mine.

Activities	Aspects Affected	Phase	Size and scale of disturbance	Mitigation Measures	Compliance with standards	Time period for implementation
				structure following site clearing and on any disturbed areas; ▪ Soil stockpiles must only be used for their designated final purposes; ▪ The stockpiles will be vegetated to reduce the risk of erosion, prevent weed growth and to reinstitute the ecological processes within the soil; ▪ Implement a Storm Water Management Plan; ▪ Should erosion form on cleared areas or topsoil berms, corrective actions, such as erosion berms, must be implemented to minimise any further erosion from taking place; ▪ Topsoil must be sourced and replaced and shaped to reduce the recurrence of erosion should any erosion occur; and ▪ Only the designated access routes must be used to reduce any unnecessary compaction.		
	Aquatics	Construction Phase Operational Phase	Local	▪ Establish silt traps within clean water channels; ▪ Only areas earmarked for infrastructure or the open pit must be cleared, no unnecessary site clearing must take place; ▪ Disturbed areas adjacent to the required cleared areas must be rehabilitated and vegetation established; ▪ Soils adjacent to the river/wetlands that have been compacted must be loosened to allow for germination of vegetation; ▪ Temporary diversion trenches and berms must be constructed to convey runoff to temporary trenches; ▪ Water management measures must be included in a SWMP and the IWWMP.	▪ National Water Act, 1998 (Act No. 36 of 1998). ▪ Rehabilitation Plan. ▪ DWS Best Practice Guideline G1: Stormwater Management. ▪ DWS Best Practice Guidelines A5. Water Management for Surface Mines.	▪ Prior to and during the Construction Phase
	Surface Water	Construction Phase Operational Phase	Local	▪ Implement a Storm Water Management Plan; ▪ All runoff emanating from the dirty water areas must be diverted through a silt trap prior to entering the PCD; ▪ Application of dust suppressants on haul roads; and ▪ The topsoil berm must be vegetated.	▪ Storm Water Management Plan according to the DWS Best Practice Guideline G1: Storm Water Management. ▪ DWS Best Practice Guidelines A5. Water Management for Surface Mines and GN 704. ▪ Surface Water Monitoring Programme according to DWS Best Practice Guidelines G3. Water Monitoring Systems.	▪ Prior to and during the Construction Phase
Haul and Access Roads	Groundwater	Construction Phase	Limited	▪ Rehabilitate disturbed areas once construction has concluded; and ▪ Only the designated access routes must be used to reduce any unnecessary compaction.	▪ National Water Act, 1998 (Act No. 36 of 1998). ▪ Rehabilitation Plan.	▪ Throughout Construction Phase

Activities	Aspects Affected	Phase	Size and scale of disturbance	Mitigation Measures	Compliance with standards	Time period for implementation
Employment and Procurement	Socio-economic	Construction Phase Operational Phase	Regional	▪ Ensure expectations within the communities and local SMMEs regarding local recruitment and local procurement, amongst other matters are managed effectively through continuous engagements; ▪ Ensure effective stakeholder management through various communication engagement mediums with stakeholders regarding the possible use of contractors, local recruitment plans, as well as preferential procurement initiatives; ▪ Implement contractor specifications to ensure that contractors are committed to the obligations of the mine with regards to local recruitment and procurement, as well as legislative and company specific obligations with regards to housing and living conditions; ▪ Constant monitoring of the region to prevent the establishment of informal settlements through partnership with the South African Police Services; and ▪ Establishing a grievance procedure to provide support to victims of social disarrays.	▪ Social and Labour Plan compliant with the Minerals and Petroleum Resources Development Act, 2002 (Act No. 28 of 2002)	▪ Throughout Project life
	Socio-economic	Construction Phase Operational Phase	Regional	▪ Include the recruitment of local employees, especially unskilled and semi-skilled individuals to align to the Waterberg's Employment Equity plans; ▪ Orientate contractors on the utilisation of the local community database through which local residents are identified for recruitment, as well as the local SMME database for local preferential procurement; ▪ Conduct regular compliance audits to ensure that contractual obligations are adhered to by all contractors, including, but not limited to: local recruitment, local procurement and housing and living conditions by contractors; and ▪ Implement contractor specifications to ensure that contractors are committed to the obligations of the mine with regards to local recruitment and procurement, as well as legislative and company specific obligations with regards to housing and living conditions.	▪ Social and Labour Plan compliant with the Minerals and Petroleum Resources Development Act, 2002 (Act No. 28 of 2002)	▪ Throughout Project life
	Socio-economic	Construction Phase Operational Phase	Regional	▪ Implement career guidance within the core and affected communities identified through this study, to orientate school children with regards to which subjects are required to obtain mining technical or non-technical qualifications; and	▪ Social and Labour Plan compliant with the Minerals and Petroleum Resources Development Act, 2002 (Act No. 28 of 2002)	▪ Throughout Project life

Activities	Aspects Affected	Phase	Size and scale of disturbance	Mitigation Measures	Compliance with standards	Time period for implementation
				▪ Implement education programmes regarding health and nutrition, as well as personal finance management to mention a few.		
Operational Phase						
Open Pit Mining	Air Quality	Operational Phase	Limited to the Project area and its immediate surrounds.	▪ Limit blasting activities to days where the wind speed is less than 5.2 m per second; and ▪ Utilise wet drilling techniques.	▪ National Dust Control Regulations (2013) of the National Environmental Management: Air Quality Act, 2004 (Act No.39 of 2004). ▪ Dust Monitoring Programme as per NEM:AQA.	▪ Prior to the commencement of the activity and for the duration of the project life.
	Aquatics	Operational Phase	Local	▪ Implement a Storm Water Management Plan; ▪ Water emanating from the dirty water areas must be collected via silt traps before entering the PCD. This water should be stored for re-use within the mine so as to prevent unnecessary discharge into the environment; ▪ Storm water management structures must be sized to accommodate the 1:50 year storm event (GN 704, 1999); and ▪ Surface water and groundwater quality monitoring must be undertaken.	▪ National Water Act, 1998 (Act No. 36 of 1998). ▪ Rehabilitation Plan. ▪ DWS Best Practice Guideline G1: Stormwater Management. ▪ DWS Best Practice Guidelines A5. Water Management for Surface Mines.	▪ Throughout Project life
	Surface Water	Operational Phase	Local	▪ Implement a Storm Water Management Plan; ▪ Water emanating from the dirty water areas must be collected via silt traps before entering the PCD. This water should be stored for re-use within the mine so as to prevent unnecessary discharge into the environment; ▪ Storm water management structures must be sized to accommodate the 1:50 year storm event (GN 704, 1999); and ▪ Water quality monitoring must be undertaken.	▪ Storm Water Management Plan according to the DWS Best Practice Guideline G1: Storm Water Management. ▪ DWS Best Practice Guidelines A5. Water Management for Surface Mines and GN 704. ▪ Surface Water Monitoring Programme according to DWS Best Practice Guidelines G3. Water Monitoring Systems.	▪ Throughout Project life
	Groundwater	Operational Phase	Project area and immediate surrounds.	▪ A numerical model specific to Kubu Coal Mine must be developed and updated to confirm the potential impacts prior to mining; ▪ Groundwater levels must be monitored and data must be captured; and ▪ Dewatering rates must be recorded.	▪ National Water Act, 1998 (Act No. 36 of 1998). ▪ Groundwater Monitoring Programme.	▪ Prior to the operational phase and then throughout the project life.
	Noise	Operational Phase	Only extending as far as Project area boundary	▪ Machinery, equipment and vehicles must be serviced to the designed requirements of the machinery/vehicles to ensure noise suppression mechanisms are effective e.g. installed exhaust mufflers; and ▪ Switching off equipment when not in use.	▪ National Noise Control Regulations, SANS 10103:2008.	▪ Throughout Operational Phase

Activities	Aspects Affected	Phase	Size and scale of disturbance	Mitigation Measures	Compliance with standards	Time period for implementation
Haul and Access Roads	Air Quality	Operational Phase	Limited to the Project area and its immediate surrounds.	▪ The drop heights when loading ROM coal and overburden onto trucks and at tipping points should be minimised; ▪ Dust suppressants and binders must be utilised on internal haul roads to reduce dust generation; and ▪ Speed limits must be enforced on site to limit dust generation (30 km/hr is recommended).	▪ National Dust Control Regulations (2013) of the National Environmental Management: Air Quality Act, 2004 (Act No.39 of 2004). ▪ Dust Monitoring Programme as per NEM:AQA.	▪ For the duration of the project life.
	Fauna and Flora	Operational Phase	6.8 km	▪ Develop and implement an Alien Invasive Management Plan ; ▪ Dust suppressants and binders must be utilised on internal haul roads to reduce dust generation; and ▪ Areas of vehicular activity must be fenced off to prevent potential impacts to fauna.	▪ Conservation of the environment as outlined in the National Environmental Management: Biodiversity Act, 2004 (Act No. 10 of 2004) ▪ South African National Biodiversity Index. ▪ Alien Invasive Management Plan. ▪ Rehabilitation Plan.	▪ Prior to the commencement of the activity and for the duration of the project life.
	Noise	Operational Phase	Only extending as far as Project area boundary	▪ Machinery, equipment and vehicles must be serviced to the designed requirements of the machinery/vehicles to ensure noise suppression mechanisms are effective e.g. installed exhaust mufflers; and ▪ Switching off equipment when not in use.	▪ National Noise Control Regulations, SANS 10103:2008.	▪ Throughout Operational Phase
Storage of Overburden	Air Quality	Operational Phase	Limited to the Project area and its immediate surrounds.	▪ ▪ Dust suppressants and binders must be utilised on internal haul roads reduce dust generation; and ▪ The overburden dump must be vegetated and maintained to prevent erosion and dust generation.	▪ National Dust Control Regulations (2013) of the National Environmental Management: Air Quality Act, 2004 (Act No.39 of 2004). ▪ Dust Monitoring Programme as per NEM:AQA.	▪ Prior to the commencement of the activity and for the duration of the project life.
	Aquatics	Operational Phase	Local	▪ Implement a Storm Water Management Plan; ▪ Water emanating from the dirty water areas must be collected via silt traps before entering the PCD. This water should be stored for re-use within the mine so as to prevent unnecessary discharge into the environment; ▪ The overburden dump must be lined in accordance with the NEM:WA and other applicable legislation. Further waste classification must be undertaken to determine the liner requirements; ▪ Storm water management structures must be sized to accommodate the 1:50 year storm event (GN 704, 1999); and ▪ Surface water and groundwater quality monitoring must be undertaken.	▪ National Water Act, 1998 (Act No. 36 of 1998). ▪ Rehabilitation Plan. ▪ DWS Best Practice Guideline G1: Stormwater Management. ▪ DWS Best Practice Guidelines A5. Water Management for Surface Mines.	▪ Prior to the operational phase and then throughout the project life.
	Surface Water	Operational Phase	Local	▪ Implement a Storm Water Management Plan; ▪ Water emanating from the dirty water areas must be collected via silt traps before entering the PCD. This water should be stored for re-use within the mine so	▪ Storm Water Management Plan according to the DWS Best Practice Guideline G1: Storm Water Management and GN 704. ▪ Surface Water Monitoring Programme.	▪ Prior to the operational phase and then throughout the project life.

Activities	Aspects Affected	Phase	Size and scale of disturbance	Mitigation Measures	Compliance with standards	Time period for implementation
				as to prevent unnecessary discharge into the environment; ▪ Storm water management structures must be sized to accommodate the 1:50 year storm event (GN 704, 1999); and ▪ Water quality monitoring must be undertaken.	▪ National Water Act, 1998 (Act No. 36 of 1998) ▪ National Environmental Management: Waste Act, 2008 (Act No. 59 of 2008).	
	Groundwater	Operational Phase	Limited	▪ Design and maintain the overburden dump to allow for maximum water runoff as opposed to infiltration into the dump; ▪ The overburden dump must be lined in accordance with the NEM:WA and other applicable legislation. Further waste classification must be undertaken to determine the liner requirements; ▪ Groundwater monitoring must be undertaken.	▪ National Water Act, 1998 (Act No. 36 of 1998) ▪ National Environmental Management: Waste Act, 2008 (Act No. 59 of 2008).	▪ Prior to the operational phase and then throughout the project life.
ROM Tip Area	Air Quality	Operational Phase	Limited to the Project area and its immediate surrounds.	▪ Enclosure of the crusher to prevent dust dispersion; and ▪ Application of water sprays at the crushers to suppress dust generation.	▪ National Dust Control Regulations (2013) of the National Environmental Management: Air Quality Act, 2004 (Act No.39 of 2004). ▪ Dust Monitoring Programme as per NEM:AQA.	▪ Prior to the commencement of the activity and for the duration of the project life.
	Aquatics	Operational Phase	Local	▪ Implement a Storm Water Management Plan; ▪ Water emanating from the dirty water areas must be collected via silt traps before entering the PCD. This water should be stored for re-use within the mine so as to prevent unnecessary discharge into the environment; ▪ The ROM tip area must be lined in accordance with the NEM:WA and other applicable legislation. Further waste classification must be undertaken to determine the liner requirements; ▪ Storm water management structures must be sized to accommodate the 1:50 year storm event (GN 704, 1999); and ▪ Surface water and groundwater quality monitoring must be undertaken.	▪ Storm Water Management Plan according to the DWS Best Practice Guideline G1: Storm Water Management and GN 704. ▪ National Water Act, 1998 (Act No. 36 of 1998) ▪ National Environmental Management: Waste Act, 2008 (Act No. 59 of 2008).	▪ Prior to the operational phase and then throughout the project life.
	Surface Water	Operational Phase	Local	▪ Implement a Storm Water Management Plan; ▪ Water emanating from the dirty water areas must be collected via silt traps before entering the PCD. This water should be stored for re-use within the mine so as to prevent unnecessary discharge into the environment; ▪ Storm water management structures must be sized to accommodate the 1:50 year storm event (GN 704, 1999); and ▪ Water quality monitoring must be undertaken.	▪ Storm Water Management Plan according to the DWS Best Practice Guideline G1: Storm Water Management and GN 704. ▪ Surface Water Monitoring Programme. ▪ National Water Act, 1998 (Act No. 36 of 1998) ▪ National Environmental Management: Waste Act, 2008 (Act No. 59 of 2008).	▪ Prior to the operational phase and then throughout the project life.

Activities	Aspects Affected	Phase	Size and scale of disturbance	Mitigation Measures	Compliance with standards	Time period for implementation
	Groundwater	Operational Phase	Limited	▪ The ROM tip area must be lined in accordance with the NEM:WA and other applicable legislation. Further waste classification must be undertaken to determine the liner requirements; ▪ Groundwater monitoring must be undertaken.	▪ National Water Act, 1998 (Act No. 36 of 1998) ▪ National Environmental Management: Waste Act, 2008 (Act No. 59 of 2008). ▪ Groundwater Monitoring Programme.	▪ Prior to the operational phase and then throughout the project life.
	Noise	Operational Phase	Only extending as far as Project area boundary	▪ Machinery, equipment and vehicles must be serviced to the designed requirements of the machinery/vehicles to ensure noise suppression mechanisms are effective e.g. installed exhaust mufflers; and ▪ Switching off equipment when not in use.	▪ National Noise Control Regulations, SANS 10103:2008.	▪ Throughout Operational Phase
PCDs	Aquatics	Operational Phase	Local	▪ Implement a Storm Water Management Plan; ▪ Water emanating from the dirty water areas must be collected via silt traps before entering the PCD. This water should be stored for re-use within the mine so as to prevent unnecessary discharge into the environment; ▪ The PCD must be lined according to the required legislation; ▪ Storm water management structures must be sized to accommodate the 1:50 year storm event (GN 704, 1999); and ▪ Surface water and groundwater quality monitoring must be undertaken.	▪ Storm Water Management Plan according to the DWS Best Practice Guideline G1: Storm Water Management and GN 704. ▪ National Water Act, 1998 (Act No. 36 of 1998) ▪ National Environmental Management: Waste Act, 2008 (Act No. 59 of 2008).	▪ Prior to the operational phase and then throughout the project life.
	Surface Water	Operational Phase	Local	▪ Implement a Storm Water Management Plan; ▪ Water emanating from the dirty water areas must be collected via silt traps before entering the PCD. This water should be stored for re-use within the mine so as to prevent unnecessary discharge into the environment; ▪ Should the contained water be more than the water use requirement within the mine, the BPGs advise that the water be recycled or as the last resort be treated to acceptable levels and discharged either to the natural environment or be supplied to other industries as a lower grade of water; ▪ Storm water management structures must be sized to accommodate the 1:50 year storm event (GN 704, 1999); and ▪ Water quality monitoring must be undertaken.	▪ Storm Water Management Plan according to the DWS Best Practice Guideline G1: Storm Water Management. ▪ DWS Best Practice Guidelines A5. Water Management for Surface Mines and GN 704. ▪ Surface Water Monitoring Programme according to DWS Best Practice Guidelines G3. Water Monitoring Systems. ▪ National Environmental Management: Waste Act, 2008 (Act No. 59 of 2008).	▪ Prior to the operational phase and then throughout the project life.
Employment and Procurement	Socio-economic	Operational Phase	Regional	▪ Implement career guidance within the core and affected communities identified through this study, to orientate school children with regards to which	▪ Social and Labour Plan compliant with the Minerals and Petroleum Resources Development Act, 2002 (Act No. 28 of 2002)	▪ Throughout Project life

Activities	Aspects Affected	Phase	Size and scale of disturbance	Mitigation Measures	Compliance with standards	Time period for implementation
				subjects are required to obtain mining technical or non-technical qualifications; and ▪ Implement education programmes regarding health and nutrition, as well as personal finance management to mention a few.		
	Socio-economic	Operational Phase	Regional	▪ Provide adequate signage in the affected areas to warn communities of the health and safety risks of heavy vehicles and machinery and the mining operations; ▪ Circumvent fatigue due to long distances by predominantly recruiting from the local core and affected communities; ▪ Conduct a transportation study to carefully consider various transportation modes, routes and service providers; and ▪ Ensure that employees are orientated regarding transportation benefit and use thereof.	▪ Social and Labour Plan compliant with the Minerals and Petroleum Resources Development Act, 2002 (Act No. 28 of 2002)	▪ Throughout Project life
	Socio-economic	Operational Phase	Regional	▪ Ensure effective expectation management of employees and communities in terms of housing expectations; ▪ Development of housing strategy upon the finalisation of all related decisions; ▪ Provide education regarding personal financial management; ▪ Ensure that employees are orientated regarding transportation benefit and use thereof; ▪ Ensure expectations within the communities and local SMMEs regarding local recruitment and local procurement, amongst other matters are managed effectively through continuous engagements; ▪ Ensure effective stakeholder management through various communication engagement mediums with stakeholders regarding the possible use of contractors, local recruitment plans, as well as preferential procurement initiatives; ▪ Implement contractor specifications to ensure that contractors are committed to the obligations of the mine with regards to local recruitment and procurement, as well as legislative and company specific obligations with regards to housing and living conditions; ▪ Constant monitoring of the region to prevent the establishment of informal settlements through partnership with the South African Police Services;	▪ Social and Labour Plan compliant with the Minerals and Petroleum Resources Development Act, 2002 (Act No. 28 of 2002)	▪ Throughout Project life

Activities	Aspects Affected	Phase	Size and scale of disturbance	Mitigation Measures	Compliance with standards	Time period for implementation
				and ▪ Establishing a grievance procedure to provide support to victims of social disarrays.		
Decommissioning Phase						
Rehabilitation	Air Quality	Decommissioning Phase	Limited to the Project area and its immediate surrounds.	▪ Application of dust suppressants on haul roads; and ▪ Vegetation must be established on rehabilitated footprints and disturbed areas and monitored to ensure successful establishment.	▪ National Dust Control Regulations (2013) of the National Environmental Management: Air Quality Act, 2004 (Act No.39 of 2004). ▪ Dust Monitoring Programme as per NEM:AQA.	▪ Prior to the commencement of the activity and for the duration of the project life.
	Soils	Decommissioning Phase	Site specific	▪ Undertake rehabilitation as per the Rehabilitation Plan.	▪ Chamber of Mines Guidelines. ▪ Rehabilitation Plan. ▪ MPRDA Regulation 56(1) to (8); soil pollution and erosion control. ▪ Conservation of Agricultural Resources Act, 1983 (Act No. 43 of 1983).	▪ During decommissioning.
	Fauna and Flora	Decommissioning Phase	551.37 ha	▪ Rehabilitation must be undertaken according to the Rehabilitation Plan; ▪ An Alien Invasive Management Plan must be developed and implemented; ▪ Temporary berms must be constructed until vegetation is established to intercept any eroded material; ▪ *A. erioloba* and *C.imberbe* must be established on site, relocated from the nursery established during the Project; and ▪ Vegetation establishment must be monitored.	▪ Conservation of the environment as outlined in the National Environmental Management: Biodiversity Act, 2004 (Act No. 10 of 2004) ▪ South African National Biodiversity Index. ▪ Biodiversity Management Plan. ▪ Alien Invasive Management Plan. ▪ Rehabilitation Plan.	▪ Following the conclusion of the mining activities.
	Aquatics	Decommissioning Phase	Local	▪ Establish silt traps within clean water channels; ▪ Limit vehicle and equipment use to the disturbed footprint areas; ▪ Establish and monitor vegetation on the Project area, as per the Rehabilitation Plan; ▪ Soils adjacent to the wetlands that have been compacted must be loosened to allow for germination of vegetation; and ▪ Temporary diversion trenches and berms must be constructed to convey runoff to temporary trenches.	▪ National Water Act, 1998 (Act No. 36 of 1998). ▪ Rehabilitation Plan. ▪ DWS Best Practice Guideline G1: Stormwater Management. ▪ DWS Best Practice Guidelines A5. Water Management for Surface Mines.	▪ Throughout Decommissioning Phase
	Surface Water	Decommissioning Phase	Local	▪ Rehabilitation must be undertaken according to the Rehabilitation Plan; ▪ Temporary berms must be constructed until vegetation is established to intercept any eroded material; ▪ Vegetation establishment must be monitored; and ▪ Water quality monitoring must be undertaken.	▪ Storm Water Management Plan according to the DWS Best Practice Guideline G1: Storm Water Management. ▪ DWS Best Practice Guidelines A5. Water Management for Surface Mines and GN 704. ▪ Surface Water Monitoring Programme according to DWS Best Practice Guidelines G3. Water Monitoring	▪ Throughout Decommissioning Phase

Activities	Aspects Affected	Phase	Size and scale of disturbance	Mitigation Measures	Compliance with standards	Time period for implementation
					Systems.	
	Groundwater	Decommissioning Phase	Limited	▪ Water quality monitoring must be undertaken.	▪ National Water Act, 1998 (Act No. 36 of 1998). ▪ Groundwater Monitoring Programme.	▪ Throughout the operation and post closure.
	Noise	Decommissioning Phase	Only extending as far as Project area boundary	▪ Restricting rehabilitation activities to daylight hours (06:00 to 18:00); ▪ Machinery, equipment and vehicles must be serviced to the designed requirements of the machinery/vehicles to ensure noise suppression mechanisms are effective e.g. installed exhaust mufflers; and ▪ Switching off equipment when not in use.	▪ National Noise Control Regulations, SANS 10103:2008.	▪ Throughout Decommissioning Phase
Infrastructure Area	Soils	Decommissioning Phase	Site specific	▪ Undertake rehabilitation as per the Rehabilitation Plan.	▪ Chamber of Mines Guidelines. ▪ Rehabilitation Plan. ▪ MPRDA Regulation 56(1) to (8); soil pollution and erosion control. ▪ Conservation of Agricultural Resources Act, 1983 (Act No. 43 of 1983).	▪ During decommissioning.
	Noise	Decommissioning Phase	Only extending as far as Project area boundary	▪ Restricting demolition and rehabilitation activities to daylight hours (06:00 to 18:00); ▪ Machinery, equipment and vehicles must be serviced to the designed requirements of the machinery/vehicles to ensure noise suppression mechanisms are effective e.g. installed exhaust mufflers; and ▪ Switching off equipment when not in use.	▪ National Noise Control Regulations, SANS 10103:2008.	▪ Throughout Decommissioning Phase
Haul and Access Roads	Soils	Decommissioning Phase	Site specific	▪ Undertake rehabilitation as per the Rehabilitation Plan.	▪ Chamber of Mines Guidelines. ▪ Rehabilitation Plan. ▪ MPRDA Regulation 56(1) to (8); soil pollution and erosion control. ▪ Conservation of Agricultural Resources Act, 1983 (Act No. 43 of 1983).	▪ During decommissioning.
Employment and Procurement	Socio-economic	Decommissioning Phase	Regional	▪ Collaborate with other industries to support the diversification of the local economy; ▪ Implement the requirements of the SLP and develop a Closure Plan prior to closure; ▪ Provide referral letters to all employees; ▪ Provide certificates of completion for all training courses, informal and formal, undertaken; and ▪ Collaborate with the relevant government departments to manage decommissioning jointly.	▪ Social and Labour Plan compliant with the Minerals and Petroleum Resources Development Act, 2002 (Act No. 28 of 2002).	▪ Throughout Project life

6 Item 1(e): Impact Management Outcomes

A description of the objectives and outcomes of the EMP is outlined in Table 6-1, taking into account the impact and mitigation type.

Table 6-1: Impact Management Outcomes

Activities	Potential impacts	Aspects affected	Phase	Mitigation type	Standard to be achieved
Construction Phase					
Site Clearing	Fugitive dust generation deteriorating ambient air quality	Air Quality	Construction Phase	Manage through: ▪ Dust monitoring plan. ▪ Dust suppression.	To ensure dust fallout complies with the NDCR levels.
	Loss of topsoil as a resource	Soils	Construction Phase	Manage through: ▪ Storm Water Management Plan; ▪ Erosion berms; and ▪ Rehabilitation Plan.	To minimise the loss of topsoil resources and to manage soil resources in terms of the Chamber of Mines Guidelines for Rehabilitation.
	Loss of vegetation, available habitats and SSC, all of which reduce biodiversity	Fauna and Flora	Construction Phase	Manage through: ▪ Nursery establishment. Compensate through: ▪ Biodiversity Land Management Plan.	To avoid and minimise the loss of vegetation, habitat types and SSC.
	Instream habitat modification	Aquatics	Construction Phase	Manage through: ▪ Storm Water Management Plan.	To maintain the PES of the aquatic ecosystems.
	Siltation of surface water resources deteriorating water quality	Surface Water	Construction Phase	Manage through: ▪ Storm Water Management Plan; and ▪ Erosion berms.	To avoid sedimentation and contamination of surface water resources.
	Reduction in groundwater recharge	Groundwater	Construction Phase	Manage through: ▪ Rehabilitation of disturbed areas; and ▪ Designated access routes.	To manage the reduction in groundwater recharge.
	Generation of noise impacting sensitive receptors	Noise	Construction Phase	Prevent through: ▪ Regular equipment, vehicles and machinery inspections and maintenance	To comply with the National Noise Control Regulations.
	Damage and destruction to unidentified heritage resources	Heritage Resources	Construction Phase	Prevent through: ▪ Chance Find Procedures	To prevent the loss or damage to identified and unidentified heritage resources.
Infrastructure Area	Fugitive dust generation deteriorating ambient air quality	Air Quality	Construction Phase	Manage through: ▪ Dust monitoring plan. ▪ Dust suppression.	To ensure dust fallout complies with the NDCR levels.

Activities	Potential impacts	Aspects affected	Phase	Mitigation type	Standard to be achieved
	Reduction in groundwater recharge	Groundwater	Construction Phase	Manage through: ▪ Rehabilitation of disturbed areas; and ▪ Designated access routes.	To manage the reduction in groundwater recharge.
	Generation of noise impacting sensitive receptors	Noise	Construction Phase	Prevent through: ▪ Regular equipment, vehicles and machinery inspections and maintenance	To comply with the National Noise Control Regulations.
Topsoil Berm	Fugitive dust generation deteriorating ambient air quality	Air Quality	Construction Phase	Manage through: ▪ Dust monitoring plan. ▪ Dust suppression.	To ensure dust fallout complies with the NDCR levels.
	Loss of topsoil as a resource	Soils	Construction Phase Operational Phase	Manage through: ▪ Storm Water Management Plan; ▪ Erosion berms; and ▪ Rehabilitation Plan.	To minimise the loss of topsoil resources and to manage soil resources in terms of the Chamber of Mines Guidelines for Rehabilitation.
	Instream habitat modification	Aquatics	Construction Phase Operational Phase	Manage through: ▪ Storm Water Management Plan.	To maintain the PES of the aquatic ecosystems.
	Siltation of surface water resources deteriorating water quality	Surface Water	Construction Phase Operational Phase	Manage through: ▪ Storm Water Management Plan; and ▪ Erosion berms.	To avoid sedimentation and contamination of surface water resources.
Haul and Access Roads	Reduction in groundwater recharge	Groundwater	Construction Phase	Manage through: ▪ Rehabilitation of disturbed areas; and ▪ Designated access routes.	To manage the reduction in groundwater recharge.
Employment and Procurement	Population influx and related impacts	Socio-economic	Construction Phase Operational Phase	Manage through: ▪ Expectation management and continuous engagement; and ▪ Centre establishment for victims of crime.	To implement the Social and Labour Plan to be compliant with the MPRDA.
	LED initiatives and economy stimulation	Socio-economic	Construction Phase Operational Phase	Enhance through: ▪ Promote local recruitment and SMMEs; and ▪ Contractor specifications.	To implement the Social and Labour Plan to be compliant with the MPRDA.
	Skills upliftment and training	Socio-economic	Construction Phase	Enhance through: ▪ Career guidance with local communities;	To implement the Social and Labour Plan to be compliant with the MPRDA.

Activities	Potential impacts	Aspects affected	Phase	Mitigation type	Standard to be achieved
			Operational Phase	▪ Skills gap analysis; and ▪ Educational programmes and training.	
Operational Phase					
Open Pit Mining	Fugitive dust generation deteriorating ambient air quality	Air Quality	Operational Phase	Manage through: ▪ Wet drilling; and ▪ Dust suppression.	To ensure dust fallout complies with the NDCR levels.
	Instream habitat modification	Aquatics	Operational Phase	Manage through: ▪ Storm Water Management Plan; and ▪ Water quality monitoring.	To maintain the PES of the aquatic ecosystems.
	Contamination of surface water resources	Surface Water	Operational Phase	Manage through: ▪ Storm Water Management Plan; and ▪ Water quality monitoring.	To avoid sedimentation and contamination of surface water resources.
	Lowering of the groundwater levels due to dewatering	Groundwater	Operational Phase	Manage through: ▪ Numerical model development; and ▪ Groundwater monitoring.	To determine and monitor the cone of depression associated with dewatering.
	Generation of noise impacting sensitive receptors	Noise	Operational Phase	Prevent through: ▪ Regular equipment, vehicles and machinery inspections and maintenance	To comply with the National Noise Control Regulations.
Haul and Access Roads	Fugitive dust generation deteriorating ambient air quality	Air Quality	Operational Phase	Manage through: ▪ Dust monitoring plan. ▪ Dust suppression.	To ensure dust fallout complies with the NDCR levels.
	Alien invasive vegetation and loss of biodiversity	Fauna and Flora	Operational Phase	Manage through: ▪ Alien Invasive Management Plan	To prevent the establishment and encroachment of alien invasive vegetation.
	Generation of noise impacting sensitive receptors	Noise	Operational Phase	Prevent through: ▪ Regular equipment, vehicles and machinery inspections and maintenance	To comply with the National Noise Control Regulations.
Storage of Overburden	Fugitive dust generation deteriorating ambient air quality	Air Quality	Operational Phase	Manage through: ▪ Dust monitoring plan. ▪ Dust suppression.	To ensure dust fallout complies with the NDCR levels.

Activities	Potential impacts	Aspects affected	Phase	Mitigation type	Standard to be achieved
	Instream habitat modification	Aquatics	Operational Phase	Manage through: ▪ Storm Water Management Plan; and ▪ Water quality monitoring.	To maintain the PES of the aquatic ecosystems.
	Contamination of surface water resources	Surface Water	Operational Phase	Manage through: ▪ Storm Water Management Plan; and ▪ Water quality monitoring.	To avoid sedimentation and contamination of surface water resources.
	Contaminated groundwater through seepage	Groundwater	Operational Phase	Manage through: ▪ Overburden dump design; ▪ Lining of overburden dump; and ▪ Groundwater monitoring.	To avoid contamination of groundwater resources.
ROM Tip Area	Fugitive dust generation deteriorating ambient air quality	Air Quality	Operational Phase	Manage through: ▪ Dust monitoring plan. ▪ Dust suppression.	To ensure dust fallout complies with the NDCR levels.
	Instream habitat modification	Aquatics	Operational Phase	Manage through: ▪ Storm Water Management Plan; and ▪ Water quality monitoring.	To maintain the PES of the aquatic ecosystems.
	Contamination of surface water resources	Surface Water	Operational Phase	Manage through: ▪ Storm Water Management Plan; and ▪ Water quality monitoring.	To avoid sedimentation and contamination of surface water resources.
	Contaminated groundwater through seepage	Groundwater	Operational Phase	Manage through: ▪ Lining of ROM tip area; and ▪ Groundwater monitoring.	To avoid contamination of groundwater resources.
	Generation of noise impacting sensitive receptors	Noise	Operational Phase	Prevent through: ▪ Regular equipment and machinery inspections and maintenance	To comply with the National Noise Control Regulations.
PCDs	Instream habitat modification	Aquatics	Operational Phase	Manage through: ▪ Storm Water Management Plan; and ▪ Water quality monitoring.	To maintain the PES of the aquatic ecosystems.

Activities	Potential impacts	Aspects affected	Phase	Mitigation type	Standard to be achieved
	Contamination of surface water resources	Surface Water	Operational Phase	Manage through: ▪ Storm Water Management Plan; and ▪ Water quality monitoring.	To avoid sedimentation and contamination of surface water resources.
Employment and Procurement	Local development	Socio-economic	Operational Phase	Manage and enhance through: ▪ Career guidance with local communities; ▪ Skills gap analysis; and ▪ Expectation management.	To implement the Social and Labour Plan to be compliant with the MPRDA.
	Health and saftey	Socio-economic	Operational Phase	Manage and enhance through: ▪ Transportation benefits.	To implement the Social and Labour Plan to be compliant with the MPRDA.
	Population influx and related impacts	Socio-economic	Operational Phase	Manage and enhance through: ▪ Personal finance management education.	To implement the Social and Labour Plan to be compliant with the MPRDA.
Decommissioning Phase					
Rehabilitation	Fugitive dust generation deteriorating ambient air quality	Air Quality	Decommissioning Phase	Manage through: ▪ Dust monitoring plan. ▪ Dust suppression.	To ensure dust fallout complies with the NDCR levels.
	Loss of topsoil as a resource through soil compaction and erosion.	Soils	Decommissioning Phase	Manage through: ▪ Rehabilitation Plan.	To minimise the loss of topsoil resources and to manage soil resources in terms of the Chamber of Mines Guidelines for Rehabilitation.
	Alien invasive vegetation establishment.	Fauna and Flora	Decommissioning Phase	Manage through: ▪ Alien Invasive Management Plan.	To prevent the establishment and encroachment of alien invasive vegetation.
	Instream habitat modification	Aquatics	Decommissioning Phase	Manage through: ▪ Rehabilitation Plan; and ▪ Vegetation establishment.	To maintain the PES of the aquatic ecosystems.
	Siltation of surface water resources deteriorating water quality	Surface Water	Decommissioning Phase	Manage through: ▪ Rehabilitation Plan; and ▪ Vegetation establishment.	To avoid sedimentation and contamination of surface water resources.
	Contaminated groundwater through seepage	Groundwater	Decommissioning Phase	Manage through: ▪ Groundwater monitoring.	To avoid contamination of groundwater resources.
	Generation of noise impacting sensitive	Noise	Decommissioning Phase	Prevent through:	To comply with the National Noise Control

Activities	Potential impacts	Aspects affected	Phase	Mitigation type	Standard to be achieved
	receptors			▪ Regular equipment and machinery inspections and maintenance	Regulations.
Infrastructure Area	Loss of topsoil as a resource through soil compaction and erosion.	Soils	Decommissioning Phase	Manage through: ▪ Rehabilitation Plan.	To minimise the loss of topsoil resources and to manage soil resources in terms of the Chamber of Mines Guidelines for Rehabilitation.
	Generation of noise impacting sensitive receptors	Noise	Decommissioning Phase	Prevent through: ▪ Regular equipment and machinery inspections and maintenance	To comply with the National Noise Control Regulations.
Haul and Access Roads	Loss of topsoil as a resource through soil compaction and erosion.	Soils	Decommissioning Phase	Manage through: ▪ Rehabilitation Plan.	To minimise the loss of topsoil resources and to manage soil resources in terms of the Chamber of Mines Guidelines for Rehabilitation.
Employment and Procurement	Dependency on mine and loss of jobs	Socio-economic	Decommissioning Phase	Manage through: ▪ SLP implementation; and ▪ Closure Plan development.	To implement the Social and Labour Plan to be compliant with the MPRDA.

7 Item 1(f): Impact Management Actions

A description of impact management actions, identifying the manner in which the impact management objectives and outcomes referenced in Sections 5 and 6 will be achieved, is provided in Table 7-1.

Table 7-1: Impact Management Actions

Activities	Potential impacts	Aspects affected	Mitigation type	Time period for implementation	Compliance with standards
Construction Phase					
Site Clearing	Fugitive dust generation deteriorating ambient air quality	Air Quality	Manage through: ▪ Dust monitoring plan. ▪ Dust suppression.	▪ Prior to the commencement of the activity and for the duration of the project life.	▪ National Dust Control Regulations (2013) of the National Environmental Management: Air Quality Act, 2004 (Act No.39 of 2004). ▪ Dust Monitoring Programme as per NEM:AQA.
	Loss of topsoil as a resource	Soils	Manage through: ▪ Storm Water Management Plan; ▪ Erosion berms; and ▪ Rehabilitation Plan.	▪ During Construction Phase	▪ Chamber of Mines Guidelines. ▪ Storm Water Management Plan. ▪ DWS Best Practice Guideline G1: Stormwater Management. ▪ DWS Best Practice Guidelines A5. Water Management for Surface Mines. ▪ Soil Stripping Guideline. ▪ Rehabilitation Plan. ▪ MPRDA Regulation 56(1) to (8); soil pollution and erosion control. ▪ Conservation of Agricultural Resources Act, 1983 (Act No. 43 of 1983).
	Loss of vegetation, available habitats and SSC, all of which reduce biodiversity	Fauna and Flora	Manage through: ▪ Plant relocation strategy; and ▪ Nursery establishment. Compensate through: ▪ Biodiversity Land Management Plan.	▪ Prior to and during the Construction Phase	▪ Conservation of the environment as outlined in the National Environmental Management: Biodiversity Act, 2004 (Act No. 10 of 2004) ▪ South African National Biodiversity Index. ▪ Biodiversity Management Plan. ▪ Alien Invasive Management Plan. ▪ Rehabilitation Plan.
	Instream habitat modification	Aquatics	Manage through: ▪ Storm Water Management Plan.	▪ Prior to and during the Construction Phase	▪ National Water Act, 1998 (Act No. 36 of 1998). ▪ Rehabilitation Plan. ▪ DWS Best Practice Guideline G1: Stormwater Management. ▪ DWS Best Practice Guidelines A5. Water Management for Surface Mines.
	Siltation of surface water resources deteriorating water quality	Surface Water	Manage through: ▪ Storm Water Management Plan; and ▪ Erosion berms.	▪ Prior to and during the Construction Phase	▪ Storm Water Management Plan according to the DWS Best Practice Guideline G1: Storm Water Management. ▪ DWS Best Practice Guidelines A5. Water Management for Surface Mines and GN 704. ▪ Surface Water Monitoring Programme according to DWS Best Practice Guidelines G3. Water Monitoring Systems.
	Reduction in groundwater recharge	Groundwater	Manage through:	▪ Throughout Construction Phase	▪ National Water Act, 1998 (Act No. 36 of 1998). ▪ Rehabilitation Plan.

Activities	Potential impacts	Aspects affected	Mitigation type	Time period for implementation	Compliance with standards
			▪ Rehabilitation of disturbed areas; and ▪ Designated access routes.		
	Generation of noise impacting sensitive receptors	Noise	Prevent through: ▪ Regular equipment, vehicles and machinery inspections and maintenance	▪ Throughout Construction Phase	▪ National Noise Control Regulations, SANS 10103:2008.
	Damage and destruction to unidentified heritage resources	Heritage Resources	Prevent through: ▪ Chance Find Procedures	▪ Prior to and during site clearing	▪ Section 34 to 37 of the National Heritage Resources Act, 1999 (Act No. 25 of 1999)
Infrastructure Area	Fugitive dust generation deteriorating ambient air quality	Air Quality	Manage through: ▪ Dust monitoring plan. ▪ Dust suppression.	▪ Prior to the commencement of the activity and for the duration of the project life.	▪ National Dust Control Regulations (2013) of the National Environmental Management: Air Quality Act, 2004 (Act No.39 of 2004). ▪ Dust Monitoring Programme as per NEM:AQA.
	Reduction in groundwater recharge	Groundwater	Manage through: ▪ Rehabilitation of disturbed areas; and ▪ Designated access routes.	▪ Throughout Construction Phase	▪ National Water Act, 1998 (Act No. 36 of 1998). ▪ Rehabilitation Plan.
	Generation of noise impacting sensitive receptors	Noise	Prevent through: ▪ Regular equipment, vehicles and machinery inspections and maintenance	▪ Throughout Construction Phase	▪ National Noise Control Regulations, SANS 10103:2008.
Topsoil Berm	Fugitive dust generation deteriorating ambient air quality	Air Quality	Manage through: ▪ Dust monitoring plan. ▪ Dust suppression.	▪ Prior to the commencement of the activity and for the duration of the project life.	▪ National Dust Control Regulations (2013) of the National Environmental Management: Air Quality Act, 2004 (Act No.39 of 2004). ▪ Dust Monitoring Programme as per NEM:AQA.
	Loss of topsoil as a resource	Soils	Manage through: ▪ Storm Water Management Plan; ▪ Erosion berms; and ▪ Rehabilitation Plan.	▪ During Construction Phase and throughout the life of mine.	▪ Chamber of Mines Guidelines. ▪ Storm Water Management Plan. ▪ DWS Best Practice Guideline G1: Stormwater Management. ▪ DWS Best Practice Guidelines A5. Water Management for Surface Mines. ▪ Soil Stripping Guideline. ▪ Rehabilitation Plan. ▪ MPRDA Regulation 56(1) to (8); soil pollution and erosion control. ▪ Conservation of Agricultural Resources Act, 1983 (Act No. 43 of 1983).
	Instream habitat	Aquatics	Manage through:	▪ Prior to and during the Construction Phase	▪ National Water Act, 1998 (Act No. 36 of 1998). ▪ Rehabilitation Plan.

Activities	Potential impacts	Aspects affected	Mitigation type	Time period for implementation	Compliance with standards
	modification		▪ Storm Water Management Plan.		▪ DWS Best Practice Guideline G1: Stormwater Management. ▪ DWS Best Practice Guidelines A5. Water Management for Surface Mines.
	Siltation of surface water resources deteriorating water quality	Surface Water	Manage through: ▪ Storm Water Management Plan; and ▪ Erosion berms.	▪ Prior to and during the Construction Phase	▪ Storm Water Management Plan according to the DWS Best Practice Guideline G1: Storm Water Management. ▪ DWS Best Practice Guidelines A5. Water Management for Surface Mines and GN 704. ▪ Surface Water Monitoring Programme according to DWS Best Practice Guidelines G3. Water Monitoring Systems.
Haul and Access Roads	Reduction in groundwater recharge	Groundwater	Manage through: ▪ Rehabilitation of disturbed areas; and ▪ Designated access routes.	▪ Throughout Construction Phase	▪ National Water Act, 1998 (Act No. 36 of 1998). ▪ Rehabilitation Plan.
Employment and Procurement	Population influx and related impacts	Socio-economic	Manage through: ▪ Expectation management and continuous engagement; and ▪ Centre establishment for victims.	▪ Throughout Project life	▪ Social and Labour Plan compliant with the Minerals and Petroleum Resources Development Act, 2002 (Act No. 28 of 2002)
	LED initiatives and economy stimulation	Socio-economic	Enhance through: ▪ Promote local recruitment and SMMEs; and ▪ Contractor specifications.	▪ Throughout Project life	▪ Social and Labour Plan compliant with the Minerals and Petroleum Resources Development Act, 2002 (Act No. 28 of 2002)
	Skills upliftment and training	Socio-economic	Enhance through: ▪ Career guidance with local communities; ▪ Skills gap analysis; and ▪ Educational programmes and training.	▪ Throughout Project life	▪ Social and Labour Plan compliant with the Minerals and Petroleum Resources Development Act, 2002 (Act No. 28 of 2002)
Operational Phase					
Open Pit Mining	Fugitive dust generation deteriorating ambient air quality	Air Quality	Manage through: ▪ Wet drilling; and ▪ Dust suppression.	▪ Prior to the commencement of the activity and for the duration of the project life.	▪ National Dust Control Regulations (2013) of the National Environmental Management: Air Quality Act, 2004 (Act No.39 of 2004). ▪ Dust Monitoring Programme as per NEM:AQA.
	Instream habitat modification	Aquatics	Manage through: ▪ Storm Water Management Plan; and ▪ Water quality monitoring.	▪ Throughout Project life	▪ National Water Act, 1998 (Act No. 36 of 1998). ▪ Rehabilitation Plan. ▪ DWS Best Practice Guideline G1: Stormwater Management. ▪ DWS Best Practice Guidelines A5. Water

Activities	Potential impacts	Aspects affected	Mitigation type	Time period for implementation	Compliance with standards
					Management for Surface Mines.
	Contamination of surface water resources	Surface Water	Manage through: ▪ Storm Water Management Plan; and ▪ Water quality monitoring.	▪ Throughout Project life	▪ Storm Water Management Plan according to the DWS Best Practice Guideline G1: Storm Water Management. ▪ DWS Best Practice Guidelines A5. Water Management for Surface Mines and GN 704. ▪ Surface Water Monitoring Programme according to DWS Best Practice Guidelines G3. Water Monitoring Systems.
	Lowering of the groundwater levels due to dewatering	Groundwater	Manage through: ▪ Numerical model development; and ▪ Groundwater monitoring.	▪ Prior to the operational phase and then throughout the project life.	▪ National Water Act, 1998 (Act No. 36 of 1998). ▪ Groundwater Monitoring Programme.
	Generation of noise impacting sensitive receptors	Noise	Prevent through: ▪ Regular equipment, vehicles and machinery inspections and maintenance	▪ Throughout Operational Phase	▪ National Noise Control Regulations, SANS 10103:2008.
Haul and Access Roads	Fugitive dust generation deteriorating ambient air quality	Air Quality	Manage through: ▪ Dust monitoring plan. ▪ Dust suppression.	▪ For the duration of the project life.	▪ National Dust Control Regulations (2013) of the National Environmental Management: Air Quality Act, 2004 (Act No.39 of 2004). ▪ Dust Monitoring Programme as per NEM:AQA.
	Alien invasive vegetation and loss of biodiversity	Fauna and Flora	Manage through: ▪ Alien Invasive Management Plan	▪ Prior to the commencement of the activity and for the duration of the project life.	▪ Conservation of the environment as outlined in the National Environmental Management: Biodiversity Act, 2004 (Act No. 10 of 2004) ▪ South African National Biodiversity Index. ▪ Biodiversity Management Plan. ▪ Alien Invasive Management Plan. ▪ Rehabilitation Plan.
	Generation of noise impacting sensitive receptors	Noise	Prevent through: ▪ Regular equipment, vehicles and machinery inspections and maintenance	▪ Throughout Operational Phase	▪ National Noise Control Regulations, SANS 10103:2008.
Storage of Overburden	Fugitive dust generation deteriorating ambient air quality	Air Quality	Manage through: ▪ Dust monitoring plan. ▪ Dust suppression.	▪ Prior to the commencement of the activity and for the duration of the project life.	▪ National Dust Control Regulations (2013) of the National Environmental Management: Air Quality Act, 2004 (Act No.39 of 2004). ▪ Dust Monitoring Programme as per NEM:AQA.
	Instream habitat modification	Aquatics	Manage through: ▪ Storm Water Management Plan; and ▪ Water quality monitoring.	▪ Prior to the operational phase and then throughout the project life.	▪ Storm Water Management Plan according to the DWS Best Practice Guideline G1: Storm Water Management and GN 704. ▪ National Water Act, 1998 (Act No. 36 of 1998) ▪ National Environmental Management: Waste Act,

Activities	Potential impacts	Aspects affected	Mitigation type	Time period for implementation	Compliance with standards
					2008 (Act No. 59 of 2008).
	Contamination of surface water resources	Surface Water	Manage through: ▪ Storm Water Management Plan; and ▪ Water quality monitoring.	▪ Prior to the operational phase and then throughout the project life.	▪ Storm Water Management Plan according to the DWS Best Practice Guideline G1: Storm Water Management. ▪ DWS Best Practice Guidelines A5. Water Management for Surface Mines and GN 704. ▪ Surface Water Monitoring Programme according to DWS Best Practice Guidelines G3. Water Monitoring Systems. ▪ National Environmental Management: Waste Act, 2008 (Act No. 59 of 2008).
	Contaminated groundwater through seepage	Groundwater	Manage through: ▪ Overburden dump design; ▪ Lining of overburden dump; and ▪ Groundwater monitoring.	▪ Prior to the operational phase and then throughout the project life.	▪ National Water Act, 1998 (Act No. 36 of 1998) ▪ National Environmental Management: Waste Act, 2008 (Act No. 59 of 2008). ▪ Groundwater Monitoring Programme.
ROM Tip Area	Fugitive dust generation deteriorating ambient air quality	Air Quality	Manage through: ▪ Dust monitoring plan. ▪ Dust suppression.	▪ Prior to the commencement of the activity and for the duration of the project life.	▪ National Dust Control Regulations (2013) of the National Environmental Management: Air Quality Act, 2004 (Act No.39 of 2004). ▪ Dust Monitoring Programme as per NEM:AQA.
	Instream habitat modification	Aquatics	Manage through: ▪ Storm Water Management Plan; and ▪ Water quality monitoring.	▪ Prior to the operational phase and then throughout the project life.	▪ Storm Water Management Plan according to the DWS Best Practice Guideline G1: Storm Water Management and GN 704. ▪ National Water Act, 1998 (Act No. 36 of 1998) ▪ National Environmental Management: Waste Act, 2008 (Act No. 59 of 2008).
	Contamination of surface water resources	Surface Water	Manage through: ▪ Storm Water Management Plan; and ▪ Water quality monitoring.	▪ Prior to the operational phase and then throughout the project life.	▪ Storm Water Management Plan according to the DWS Best Practice Guideline G1: Storm Water Management. ▪ DWS Best Practice Guidelines A5. Water Management for Surface Mines and GN 704. ▪ Surface Water Monitoring Programme according to DWS Best Practice Guidelines G3. Water Monitoring Systems. ▪ National Environmental Management: Waste Act, 2008 (Act No. 59 of 2008).
	Contaminated groundwater through seepage	Groundwater	Manage through: ▪ Lining of ROM tip area; and ▪ Groundwater monitoring.	▪ Prior to the operational phase and then throughout the project life.	▪ National Water Act, 1998 (Act No. 36 of 1998) ▪ National Environmental Management: Waste Act, 2008 (Act No. 59 of 2008). ▪ Groundwater Monitoring Programme.

Activities	Potential impacts	Aspects affected	Mitigation type	Time period for implementation	Compliance with standards
	Generation of noise impacting sensitive receptors	Noise	Prevent through: ▪ Regular equipment and machinery inspections and maintenance	▪ Throughout Operational Phase	▪ National Noise Control Regulations, SANS 10103:2008.
PCDs	Instream habitat modification	Aquatics	Manage through: ▪ Storm Water Management Plan; and ▪ Water quality monitoring.	▪ Prior to the operational phase and then throughout the project life.	▪ Storm Water Management Plan according to the DWS Best Practice Guideline G1: Storm Water Management and GN 704. ▪ National Water Act, 1998 (Act No. 36 of 1998) ▪ National Environmental Management: Waste Act, 2008 (Act No. 59 of 2008).
	Contamination of surface water resources	Surface Water	Manage through: ▪ Storm Water Management Plan; and ▪ Water quality monitoring.	▪ Prior to the operational phase and then throughout the project life.	▪ Storm Water Management Plan according to the DWS Best Practice Guideline G1: Storm Water Management. ▪ DWS Best Practice Guidelines A5. Water Management for Surface Mines and GN 704. ▪ Surface Water Monitoring Programme according to DWS Best Practice Guidelines G3. Water Monitoring Systems. ▪ National Environmental Management: Waste Act, 2008 (Act No. 59 of 2008).
Employment and Procurement	Local development	Socio-economic	Manage and enhance through: ▪ Career guidance with local communities; ▪ Skills gap analysis; and ▪ Expectation management.	▪ Throughout Project life	▪ Social and Labour Plan compliant with the Minerals and Petroleum Resources Development Act, 2002 (Act No. 28 of 2002)
	Health and safety	Socio-economic	Manage and enhance through: ▪ Transportation benefits.	▪ Throughout Project life	▪ Social and Labour Plan compliant with the Minerals and Petroleum Resources Development Act, 2002 (Act No. 28 of 2002)
	Population influx and related impacts	Socio-economic	Manage and enhance through: ▪ Personal finance management education.	▪ Throughout Project life	▪ Social and Labour Plan compliant with the Minerals and Petroleum Resources Development Act, 2002 (Act No. 28 of 2002)
Decommissioning Phase					
Rehabilitation	Fugitive dust generation deteriorating ambient air quality	Air Quality	Manage through: ▪ Dust monitoring plan. ▪ Dust suppression.	▪ Prior to the commencement of the activity and for the duration of the project life.	▪ National Dust Control Regulations (2013) of the National Environmental Management: Air Quality Act, 2004 (Act No.39 of 2004). ▪ Dust Monitoring Programme as per NEM:AQA.
	Loss of topsoil as a resource through soil compaction and erosion.	Soils	Manage through: ▪ Rehabilitation Plan.	▪ During decommissioning.	▪ Chamber of Mines Guidelines. ▪ Rehabilitation Plan. ▪ MPRDA Regulation 56(1) to (8); soil pollution and erosion control. ▪ Conservation of Agricultural Resources Act, 1983 (Act

Activities	Potential impacts	Aspects affected	Mitigation type	Time period for implementation	Compliance with standards
					No. 43 of 1983).
	Alien invasive vegetation establishment.	Fauna and Flora	Manage through: ▪ Alien Invasive Management Plan.	▪ Following the conclusion of the mining activities.	▪ Conservation of the environment as outlined in the National Environmental Management: Biodiversity Act, 2004 (Act No. 10 of 2004) ▪ South African National Biodiversity Index. ▪ Biodiversity Management Plan ▪ Alien Invasive Management Plan. ▪ Rehabilitation Plan.
	Instream habitat modification	Aquatics	Manage through: ▪ Rehabilitation Plan; and ▪ Vegetation establishment.	▪ Throughout Decommissioning Phase	▪ National Water Act, 1998 (Act No. 36 of 1998). ▪ Rehabilitation Plan. ▪ DWS Best Practice Guideline G1: Stormwater Management. ▪ DWS Best Practice Guidelines A5. Water Management for Surface Mines.
	Siltation of surface water resources deteriorating water quality	Surface Water	Manage through: ▪ Rehabilitation Plan; and ▪ Vegetation establishment.	▪ Throughout Decommissioning Phase	▪ Storm Water Management Plan according to the DWS Best Practice Guideline G1: Storm Water Management. ▪ DWS Best Practice Guidelines A5. Water Management for Surface Mines and GN 704. ▪ Surface Water Monitoring Programme according to DWS Best Practice Guidelines G3. Water Monitoring Systems.
	Contaminated groundwater through seepage	Groundwater	Manage through: ▪ Groundwater monitoring.	▪ Throughout the operation and post closure.	▪ National Water Act, 1998 (Act No. 36 of 1998). ▪ Rehabilitation Plan. ▪ Groundwater Monitoring Programme.
	Generation of noise impacting sensitive receptors	Noise	Prevent through: ▪ Regular equipment and machinery inspections and maintenance	▪ Throughout Decommissioning Phase	▪ National Noise Control Regulations, SANS 10103:2008.
Infrastructure Area	Loss of topsoil as a resource through soil compaction and erosion.	Soils	Manage through: ▪ Rehabilitation Plan.	▪ During decommissioning.	▪ Chamber of Mines Guidelines. ▪ Rehabilitation Plan. ▪ MPRDA Regulation 56(1) to (8); soil pollution and erosion control. ▪ Conservation of Agricultural Resources Act, 1983 (Act No. 43 of 1983).
	Generation of noise impacting sensitive receptors	Noise	Prevent through: ▪ Regular equipment and machinery inspections and maintenance	▪ Throughout Decommissioning Phase	▪ National Noise Control Regulations, SANS 10103:2008.
Haul and Access Roads	Loss of topsoil as a resource through soil	Soils	Manage through: ▪ Rehabilitation Plan.	▪ During decommissioning.	▪ Chamber of Mines Guidelines. ▪ Rehabilitation Plan. ▪ MPRDA Regulation 56(1) to (8); soil pollution and

Activities	Potential impacts	Aspects affected	Mitigation type	Time period for implementation	Compliance with standards
	compaction and erosion.				erosion control. ▪ Conservation of Agricultural Resources Act, 1983 (Act No. 43 of 1983).
Employment and Procurement	Dependency on mine and loss of jobs	Socio-economic	Manage through: ▪ SLP implementation; and ▪ Closure Plan development.	▪ Throughout Project life	▪ Social and Labour Plan compliant with the Minerals and Petroleum Resources Development Act, 2002 (Act No. 28 of 2002).

8 Financial provision

8.1 Item (i)(1): Determination of the Amount of Financial Provision

8.1.1 Item (i)(1)(a): Describe the Closure Objectives and the Extent to which they have been Aligned to the Baseline Environment described under Regulation 22 (2) (d) as described in 2.4 herein

In terms of the environmental objectives (Section S24 (R)(3) of the NEMA), the applicant is required to plan, manage and implement procedures and requirements in respect of the closure of a mine. They are required to:

- Rehabilitate the land which was impacted by the mining activity and the related infrastructure to meet the closure objectives;
- Remove all infrastructure built in relation to the mining operations which will not be used by the landowners or a third party. Should it happen that the third party may want to use the infrastructure, appropriate arrangements should be made to ensure long term sustainable use of the infrastructure;
- Follow a process of closure that is progressive and integrated into the short and long-term plans;
- Assess the closure impacts proactively at regular intervals throughout project life;
- Implement progressive rehabilitation measures, beginning during the construction phase wherever possible;
- Monitor and manage water on site to minimise soil, surface/groundwater contamination;
- Comply with national closure and rehabilitation regulatory requirements;
- Form active partnerships with local communities to take management of the land after the project has ceased, where possible; and
- To maintain and monitor all rehabilitated areas following re-vegetation. If monitoring shows that the objectives have been met, an application for closure can be made.

The final land use for the Project site will be determined based on consultation with the local municipality and affected communities. The overall rehabilitation objectives, and requirements, for the Kubu Coal Mine have been developed with the baseline environment in mind and are as follows:

- Leave a safe and stable environment for both humans and animals and make their condition sustainable;
- Comply with local and national regulatory requirements;
- Maintain and minimise impacts to the ecosystem within the study area;

- Re-establishment of the pre-mining land capability to allow for a suitable post mining land use;
- Maintain and minimise impacts to the functioning floodplain and waterbodies within the area;
- Implement progressive rehabilitation measures where possible (i.e. contractors camps and areas used during the construction phase);
- Prevent soil, surface water and groundwater contamination;
- Comply with the relevant local and national regulatory requirements; and
- Maintain and monitor the rehabilitated areas.

8.1.2 Item (i)(1)(b): Confirm specifically that the Environmental Objectives in relation to Closure have been consulted with Landowner and Interested and Affected Parties

This EIA and EMP report, which details the environmental objectives associated with rehabilitation and closure, was made available for public review for a period of 30 days from 5 February 2016 to 7 March 2016.

8.1.3 Item (i)(1)(c): Provide a Rehabilitation Plan that describes and shows the Scale and Aerial Extent of the Main Mining Activities, including the Anticipated Mining Area at the time of Closure

A Rehabilitation Plan has been compiled specifically for the Kubu Coal Mine Project and is attached as Appendix M.

8.1.4 Item (i)(1)(d): Explain why it can be Confirmed that the Rehabilitation Plan is compatible with the Closure Objectives

Relevant legislation governing mine rehabilitation, closure cost assessment (closure provision) and closure planning is described in the MRPDA and the EIA Regulations, 2014 in terms of the NEMA. Since the same legislation governs the development of a Rehabilitation Plan as well as determining the closure objectives, these two aspects are compatible.

The Rehabilitation Plan has been compiled in support of the primary closure objectives which are to remove unwanted infrastructure and rehabilitate the land to a suitable post-mining land use which provides a safe and stable environment for surrounding receptors and faunal species.

8.1.5 Item (i)(1)(e): Calculate and State the Quantum of the Financial Provision required to Manage and Rehabilitate the Environment in accordance with the Applicable Guideline

The financial provision assessment focused on the proposed mining activities and was calculated by means of the DMR's standard method for assessment of mine closure.

Activities incorporated into the calculation included the demolition and management of physical infrastructure and the rehabilitation of the areas affected by mining activities.

The areas for the mine which needed to be included in the current assessment were provided to Digby Wells by the applicant. The closure cost for the first year of mining has been calculated at **R 11 768 408**. The total cost includes contingencies of 10%, Preliminary and General of 12% and is inclusive of VAT at 14%. The financial provision breakdown is listed in Table 8-1.

Table 8-1: Closure Liability Costs for Year One of Mining

No.:	Description: Class C (Low Risk)	Unit:	Quantity	Master rate	Amount (Rands)
2 (A)	Demolition of steel buildings & Structures	m^2	16421.18	187.53	R 3 079 480
2 (B)	Demolition of reinforced concrete buildings & structures	m^2	5797.27	276.36	R 1 602 113
3	Rehabilitation of access roads	m^2	49200.00	33.56	R 1 651 341
6	Opencast rehabilitation including final voids & ramps3	ha	4.00	196 610.70	R 786 443
8 (A)	Rehabilitation of overburden & spoils	ha	3.00	131 073.80	R 393 221
8 (C)	Rehabilitation of processing waste deposits & evaporation ponds (acidic, metal-rich waste)	ha	0.07	474 155.54	R 30 944
10	General surface rehabilitation	ha	2.22	103 832.56	R 230 700
11	River diversions	ha	0.00	103 832.56	R 0
12	Fencing	m	0.00	118.44	R 0
13	Water management**	ha	4.00	39 480.06	R 157 920
14	2 to 3 years of maintenance & aftercare	ha	14.21	13 818.02	R 196 314
				(Sum of items 1 to 15 Above)	**R 8 128 476**
			Sub Total 1 Weighting factor 2 (step 4.4)	**1.05**	**R 8 534 900**
			Preliminary and General	12% of Subtotal 1	R 975 417
			Contingency	10% of Subtotal 1	R 812 848
	Sub Total 2 (Subtotal 1 plus sum of management & administrative items, 1 to 6 above)				**R 10 323 165**
				VAT (14%)	R 1 445 243
				Grand Total for YEAR 1 (Subtotal 2 plus VAT)	**R 11 768 408**

8.1.6 Item (i)(1)(f): Confirm that the financial provision will be provided as determined

Provided the Mining Right is approved, WOC will be responsible to provide for closure as per the legal requirements. A liability assessment will also need to be undertaken annually to ensure the financial provision is in line with the closure cost.

9 Monitoring Compliance with and Performance Assessment

WOC will be responsible for the implementation of all of the monitoring of mitigation and management measures, as well as compliance with the EMP. The recommended monitoring for the identified impacts is detailed below and in Plan 25, Appendix A. WOC will keep a record of all environmental monitoring undertaken as part of the Kubu Coal Mine. A summary of the environmental monitoring to be undertaken is included in Table 9-7.

9.1 Item 1(g): Monitoring of Impact Management Actions

9.1.1 Air Quality

9.1.1.1 Dust Monitoring Programme

The monitoring of dust deposition rates has been ongoing since November 2014 to date by the adjacent Boikarabelo Coal Mine. It is advised that such monitoring be continued during the Project life. This will ensure historical data needed to fully understand and address fugitive emissions from the proposed operation are available for assessment. If sources of fugitive dust are managed effectively at the proposed Kubu Coal Mine, there will be overall reduction in exposure concentrations and fewer disturbances to existing flora and fauna habitats. The current monitoring locations (Plan 5, Appendix A) have been reviewed and it is recommended that collaborative monitoring is undertaken with Boikarabelo Coal Mine; new monitoring locations have been recommended in Plan 25, Appendix A. The number of monitoring locations for the Boikarabelo Coal Mine and Kubu Coal Mine are sufficient, with additional locations of the dust buckets positioned for receptors to the west of Koert Louw Zyn Pan, as well as upwind of Kubu Coal Mine.

9.1.1.2 PM_{10} Monitoring Programme

Boikarabelo Coal Mine intends to commission a PM_{10} monitoring site. It is recommended that collaboration between Kubu Coal Mine and Boikarabelo Coal Mine is undertaken for PM_{10} monitoring. One PM_{10} monitoring location is considered sufficient for both operations. Should Boikarabelo Coal Mine not implement the PM_{10} monitoring site, it is strongly recommended that Kubu Coal Mine establish a PM_{10} monitoring site. A single PM_{10} monitoring site in the area to collect data will be useful should the mines come under scrutiny from regulatory agencies (proactive approach).

9.1.2 Soils

The soils monitoring plan guidelines should be put in place to ensure the best chances of rehabilitative success from a soils perspective.

Progressive monitoring must take place and the required monitoring timeframes include:

- Monitoring of soil stockpiles and recording volumes of soil within each stockpile on a quarterly basis;
- Fertility analysis and amelioration procedures as an when rehabilitation is undertaken; and
- Record keeping of incidents of contamination and remediation that has been undertaken in the event contamination to soil occurs.

9.1.3 Fauna and Flora

Monitoring will ensure that the ecological conditions of the Project area are known throughout the lifespan of the Project. It is important to monitor and understand the results of monitoring as this will give an indication of the effectiveness of mitigation measures, unexpected impacts and any changes in the biodiversity as result of the mine and/or mitigation measures.

The adjacent Boikarabelo Coal Mine has developed and implemented a biodiversity land management plan, along with other commitments outlined in its EMP. In addition, continuous faunal monitoring takes place by the Boikarabelo Coal Mine, such as vulture monitoring, sightings site plan of large predator species, the establishment of camera traps and game counting where possible. It is recommended that the monitoring procedures and biodiversity land management plan implemented for Boikarabelo Coal Mine is adopted and collaborative monitoring between the two operations undertaken to assist in the monitoring of site specific fauna and flora, as well as for the larger areas combined.

In addition, biennial monitoring is recommended for Kubu Coal Mine which must aim to identify, record and monitor germination and growth or condition of Red Data and protected plant species, alien invasive plant monitoring, ecological succession and any significant change in decreasers and increasers or indigenous invader species, as well as Red Data faunal species. Transects have been recommended that can be monitored effectively and efficiently within the undisturbed areas of Koert Louw Zyn Pan. The faunal and floral monitoring must aim to provide recommendations and management measures to implement within the biodiversity land management plan.

It is recommended that detailed monitoring, or annual monitoring, takes place should the transect surveys establish significant changes to species of concern, or should the annual average rainfall differ by +- 150mm. The surveys in this case should occur as close to the end of the wet season as possible. The fauna and flora monitoring programme is outlined in Table 9-1.

Table 9-1: Fauna and Flora Monitoring Programme

Monitoring Aspect	Responsible Person	Reason	Frequency
Alien Invasive vegetation	Mine Personnel	To assess the extent of alien invasive vegetation establishment.	Bi-annual.
Faunal Species of concern	Mine Personnel	A site plan of identified species of concern, such as large predators.	As and when identified by mine personnel.
Flora and fauna species of concern and diversity along recommended transects	Environmental Consultant	To assess the species composition and evaluate the changes within the plant communities, as well as to identify potential impacts to species of concern. Monitoring must tie into the biodiversity land management plan	Biennial during or immediately after growing season. Should the transects determine a significant change to species of concern, or unusual rainfall of +- 150 mm of annual average, annual monitoring for that year must take place.
Overall Ecological Condition	Environmental Consultant	To assess the conditions of the ecology within the area and make recommendations on any changes that need to be made with regards to the EMP.	Every 3 years

9.1.4 Aquatics

An aquatic biomonitoring programme is an essential management tool. The monitoring programme should be designed to enable the detection of potential negative impacts brought about by the proposed Project.

Aquatic biota has been proven to be excellent indicators of water quality and ecosystem health. In addition, aquatic biota can detect slight changes in the aquatic environment, which have been shown to be a fluctuating within the system. Table 9-2 highlights some important aspects to monitor in reference to aquatic biota for the duration of the proposal.

Boikarabelo Coal Mine currently undertakes biomonitoring at the locations provided in PLan 25, Appendix A. It is recommended that the data from the biomonitoring is used, through collaboration with Boikarabelo Coal Mine, and supplemented with the monitoring locations LED2 and LED3, as provided in Plan 25, Appendix A. The existing Boikarabelo Coal Mine biomonitoring accounts for upstream and downstream of the Kubu Coal Mine, with the additional sites located to monitor potential impacts within the meandering arm; a tributary of the Limpopo River.

Table 9-2: Aquatic ecology monitoring programme

Location	Monitoring Objectives	Frequency of Monitoring	Parameters to be Monitored
Data from the Boikarabelo Coal Mine biomonitoring must be used to supplement monitoring at sited LED2 and LED3.	Determine if habitat deterioration is occurring.	Bi-annual (June and July; February and March)	Water clarity should not vary between surveys, by more than 30%.
Boikarabelo Coal Mine monitoring data and additional monitoring at LED2 and LED3 (Plan 25, Appendix A)	Determine if water quality deterioration is occurring.	Bi-annual	SASS5 scores should not decrease as a result of the project (currently impacts are related to ash dump and habitat modification).
Surface water monitoring locations (Plan 25, Appendix A)	Determine if water quality deterioration is occurring.	Quarterly	Standard water quality monitoring, as per the surface water specialist report.
Boikarabelo Coal Mine monitoring data and additional monitoring at LED2 and LED3 (Plan 25, Appendix A)	Determine if water/habitat quality deterioration is occurring.	Bi-annual	Monitor for presence of fish using the FRAI method.

Key performance indicators for the aquatic biomonitoring study would be an improvement of SASS5 scores, ASPT values and the increased presence of fish (when compared to the baseline outlined in the Aquatics Impact Assessment in Appendix G).

9.1.5 Surface Water

Water quality monitoring is currently undertaken by Boikarabelo Coal Mine and it is recommended that collaborative monitoring between Boikarabelo Coal Mine and Kubu Coal Mine is undertaken at the locations provided in Table 9-3. The surface water monitoring programme is detailed in Table 9-4.

Table 9-3: Recommended Surface Water Monitoring Locations

Monitoring Location ID	Latitude	Longitude
ZPSW3	23° 32' 06" S	27° 10' 56" E
ZPSW4	23° 32' 09" S	27° 12' 16" E
Water Monitoring Locations undertaken by Boikarabelo Coal Mine		
W1SP1	23° 32' 38" S	27° 11' 06" E
W1SP2	23° 32' 25" S	27° 11' 23" E
WSP8	23° 31' 57" S	27° 12' 07" E

Table 9-4: Surface Water Monitoring Programme

Monitoring Element	Frequency	Responsibility
Water quality	▪ Quarterly water quality monitoring must continue for the LoM. However, if an unusual water quality change is identified, monthly monitoring should be undertaken to monitor and evaluate this change/ or in the event of a pollution incident; ▪ Monitoring can be reduced to biannually (wet and dry season) following rehabilitation of the Project area; and ▪ Biannual monitoring must continue following closure until the DWS approves the ceasing of monitoring requirements.	Environmental Officer
Water quantity	▪ Monthly water quantity monitoring in the PCDs.	Environmental Officer/Designated mine personnel
Physical structures and SWMP performance	▪ As often as possible, particularly following rainfall events. This will ensure that leaks and overflows are detected immediately before a	Environmental Officer/ Engineering

Monitoring Element	Frequency	Responsibility
	significant impact occurs; and ▪ Quarterly or monthly with the general maintenance schedule at the mine.	

9.1.6 Groundwater

The groundwater monitoring network has been designed to comply with the risk based source-pathway-receptor principle and contains monitoring locations which can assess the groundwater status at certain areas. Both the impact on water quality and water quantity must be catered for. The components of the groundwater monitoring network are discussed further below.

9.1.6.1 Monitoring Locations

A preliminary groundwater monitoring programme was established based on the data collected during the April 2015 hydrocensus (Plan 16, Appendix A). The recommended boreholes to be used for monitoring are provided in Table 9-5. A quarterly monitoring programme must be initiated with the following objectives:

- The generation of baseline, as well as continuous data for the life of mine;
- To serve as an early detection system to allow for remedial and mitigation measures to be taken for the mining area and affected region;
- The identification of current sources and/or areas of contamination and the extent thereof (and later associated with mining which constitutes legal implications or liabilities associated with risks of contamination migrating off site);
- Assessment of compliance with standards and relevant legislation i.e. DWS Guidelines; and
- Assessment of the impacts of the construction or mining operation and activities on the receiving environment.

Groundwater monitoring must be conducted to assess the following potential impacts:

- Groundwater Quantity: which will be achieved by monitoring the pit dewatering volumes during operations and the water levels of monitoring boreholes at the mining area; and
- Groundwater Quality: This will be achieved by sampling of the groundwater in the boreholes, at the recommended frequency.

The monitoring programme should also be reviewed and updated on an annual basis to ensure that the groundwater monitoring and impact assessment is accurate and effective Table 9-5. The recommended monitoring location D06 is already monitored as part of the

Boikarabelo Coal Mine. It is recommended that collaborative monitoring of this borehole is undertaken between Boikarabelo Coal Mine and Kubu Coal Mine.

Table 9-5: Recommended groundwater monitoring sites.

Site ID	Coordinates	
	Latitude	**Longitude**
KSGW1	23°32'22.20"S	27°11'26.50"E
KZGW3	23°32'44.95"S	27° 9'21.89"E
KZGW4	23°33'52.25"S	27° 9'21.81"E
KSGW9	23°32'37.60"S	27°12'40.70"E
Boikarabelo Coal Mine Monitoring Location		
D06	23°34'53.10"S	27°11'50.30"E

9.1.6.2 Sample Analysis

Samples taken during monitoring runs should be submitted to a SANAS accredited laboratory and analysed for the following parameters (Table 9-6).

Table 9-6: Parameter list for Monitoring Water Quality

Chemical Parameters
Cl; SO_4; NO_3 -N; NO_2 - N; PO_4; NH_{3+4}, Fluoride
Al, Ca, Fe, K, Mg, Mn, Na, Cr, Cu, Ni, Cd, Co, Pb, Zn
pH & Electrical Conductivity (EC)
Total Hardness
Total Alkalinity
Total Dissolved Solids (TDS)
Dissolved oxygen
Bicarbonate as HCO_3 (Alkalinity)
Carbonate as CO_3 (Alkalinity)
Cr (III)
Pb
B
Hg

Chemical Parameters
As and Se
Acidity
Uranium

9.2 Item 1(h): Monitoring and Reporting Frequency

The monitoring and reporting frequency for the monitoring programmes per environmental aspect are supplied in Table 9-7.

9.3 Item 1(i): Responsible Persons

The responsible persons for the respective monitoring programmes are detailed in Table 9-7.

9.4 Item 1(j): Time Period for Implementing Impact Management Actions

The time period for implementing impact management actions has been provided for in Table 9-7.

9.5 Item 1(k): Mechanism for Monitoring Compliance

Table 9-7 sets out the method of monitoring the implementation of the impact management actions, the frequency of monitoring the implementation of the impact management actions, an indication of the persons who will be responsible for the implementation of the impact management actions, the time periods within which the impact management actions must be implemented and the mechanism for monitoring compliance with the identified impact management actions. The recommended monitoring plans are provided in Plan 25, Appendix A.

Table 9-7: Monitoring and Management of Environmental Impacts

Activities	Impacts Requiring Monitoring Programmes	Functional Requirements for Monitoring	Roles and Responsibilities (For the execution of the monitoring programmes)	Monitoring and Reporting Frequency and Time Periods for Implementing Impact Management Actions
All Project Activities	Fugitive dust emissions deteriorating ambient air quality.	The following aspects should be monitored on a continuous basis, with analysis taking place monthly and quarterly reporting: ▪ Dust deposition; and ▪ PM10.	An Air Quality Specialist must undertake the monitoring of the air quality and must be responsible for the changing of the dust buckets on a monthly basis.	The dust buckets must be analysed on a monthly basis, with a report compiled every quarter. The Environmental Manager will be responsible for implementing impact management actions based on the findings and results of the quarterly reports.
	Loss of topsoil as a resource	Progressive monitoring must be undertaken by the Environmental Manager to assess the following: ▪ Volume of soils within the soil stockpiles on a quarterly basis; ▪ Fertility analysis and amelioration of soils prior to rehabilitation; and ▪ Record keeping of any incidents on site that has led to soil contamination and the remediation undertaken thereafter.	It is the responsibility of the Environmental Manager to undertake, or to appoint a soil scientist, the soil monitoring of the stockpiles on a quarterly basis, as well as to ensure that soils are analysed prior to rehabilitation. Record keeping of any incidents that have led to soil contamination must be undertaken.	The volume of the soil stockpiles/berms but be undertaken on a quarterly basis and records kept on site. The fertility analysis must only be undertaken prior to the soils being used for rehabilitation. Reporting of soil contamination from incidents must be undertaken as and when an incident has occurred.
	Loss of biodiversity	The fauna and flora monitoring must be undertaken with the implementation of the biodiversity land management plan objectives in mind and as follows: ▪ Alien invasive vegetation establishment on a bi-annual basis; ▪ Biennial monitoring of transects to determine changes or impacts to species of concern. Detailed or annual monitoring to take place should significant changes to species of concern be identified or for years where annual rainfall differs by +-150 mm; and ▪ Overall ecology of the Project area every 3 years.	An independent ecologist must undertake the fauna and flora monitoring and compile a report following the monitoring. It is the responsibility of the Environmental Manager to appoint the ecologist on an annual basis.	Monitoring must be undertaken as detailed and reporting must take place following the site inspections. The reporting must detail the changes in the biodiversity based on previous monitoring findings.
	Impact to water quality and aquatic ecosystems.	Bi-annual aquatic monitoring must take place and must include monitoring of the water clarity, SASS5 scores and the presence of fish. The bi-annual monitoring must be undertaken during the high-flow and low-flow seasons. The aquatic monitoring locations utilised in the Aquatic Impact Assessment must be used. In addition, quarterly water quality monitoring must be undertaken.	An independent Aquatic Ecologist must be appointed for the bi-annual monitoring.	Bi-annual monitoring and reporting must be undertaken by the independent aquatic ecologist.
	Impact to surface water quantity and quality.	Quarterly surface water quality monitoring must continue at the monitoring locations as stipulated in Table 9-3. Water quality monitoring can be reduced to biannually during decommissioning and post closure, although monitoring frequency must be increased should water quality deteriorate throughout the LoM. Water quantity in PCDs and storm water management structures must be visually monitored following rainfall events.	It is the responsibility of the Environmental Manager to undertake, or to appoint a hydrologist, the surface water monitoring for both water quality and quantity. All records of data must be kept on site.	Quarterly water quality monitoring during the operational phase, with biannual monitoring during the decommissioning and post closure. Monitoring frequency to increase should impacts occur. Surface water quantity monitoring must be undertaken monthly.

Activities	Impacts Requiring Monitoring Programmes	Functional Requirements for Monitoring	Roles and Responsibilities (For the execution of the monitoring programmes)	Monitoring and Reporting Frequency and Time Periods for Implementing Impact Management Actions
	Deterioration of groundwater quality and reduction in water levels.	Water levels must be monitored on a monthly basis by a groundwater specialist at the boreholes listed in Table 9-5. In addition to the monitoring of the water levels, groundwater quality monitoring must be undertaken on a quarterly basis and must analyse the following constituents: ▪ Macro Analysis i.e. Ca, Mg, Na, K, SO4, NO3, F, Cl; ▪ Initial full suite metals and then As, Al, Fe, Mn and other metals identified according to results of the initial analyses; ▪ Se and As; ▪ pH and Alkalinity; and ▪ TDS and EC.	A groundwater specialist must undertake the monthly water level monitoring and quarterly groundwater quality monitoring.	Water levels will be monitored monthly, with groundwater quality monitored on a quarterly basis. A database must be managed and must keep records of all monitoring results. A report must be compiled on a quarterly basis detailing the results of the water levels and groundwater quality.

10 Item 1(l): Indicate the Frequency of the Submission of the Performance Assessment Report

A performance assessment will be undertaken on an annual basis by an independent consultant. Following the performance assessment, a report will be compiled and submitted to the DMR for review.

11 Item 1(m): Environmental Awareness Plan

11.1 Item 1(m)(1): Manner in which the Applicant Intends to Inform his or her Employees of any Environmental Risk which may Result from their Work

WOC has established an environmental awareness plan to inform employees of any environmental risk that may result from their work. This environmental awareness plan includes both internal and external communication. The various campaigns and plans are discussed in further detail in this section.

11.1.1 Internal Communication and Awareness Campaign

Internal communication will be conducted on a monthly basis and will include:

- Environmental Management System (EMS) Working Group:
  - Kubu Coal Mine will identify applicable employees, which includes the management team, to form an EMS working group which discusses all relevant environmental issues, action plans to be draft and follow-ups on these meetings on a monthly basis.
- Management meetings:
  - Kubu Coal Mine will conduct monthly meetings where the relevant Health, Safety, Environmental and Community (HSEC) issues are raised and discussed with the General Manager.
- Review meetings:
  - Mine management will provide feedback to the Operations Director on a monthly basis and all HSEC issues will be included in these meetings.
- Group Environmental Operations Meeting:
  - The Environmental Manager will attend a group meeting where all relevant environmental issues are to be discussed. Monthly environmental reports will be compiled and distributed to management for discussion.

11.1.2 External Communication and Awareness Campaign

The external communication and awareness campaign includes the following:

- Stakeholder register:
  - The stakeholder register will be continuously updated to include any person or group of people who are interested and/or affected by the HSEC or Operational performances of the mine, excluding employees. The register will contain a list of all stakeholders and include the name of the stakeholder organisation, contact name, address, e-mail address, as well as telephone, cell phone and fax numbers. This register will be maintained by the Community Development Practitioner and updated on a bi-annual basis.
- Stakeholder Reports:
  - The HSEC reports will be prepared annually and distributed to all the major stakeholders. To encourage feedback and facilitate stakeholder participation, each report will contain a feedback sheet, which will allow the stakeholders to change their contact details and to comment or ask questions on HSEC matters. Any feedback sheets received will be dealt with in accordance with fixed operating procedures and any actions taken will be recorded for reference purposes.
- Public Forums:
  - Annual public meetings/community forums will be held with major stakeholders to present and/or discuss HSEC issues regarding the mine. A register of attendees will be kept and minutes taken during the proceedings, which will be distributed to all the major stakeholders, whether they attended or not. To encourage feedback and facilitate stakeholder participation, feedback sheets will be handed to each stakeholder on registration and collected after the forum. This will allow the stakeholders to change their contact details and to comment or ask questions on HSEC matters. Any feedback sheets received will be dealt with in accordance with fixed operating procedure and any actions taken are recorded for reference purposes.
- External Complaints Register:
  - An HSEC external complaints register will be stationed with the Community Development Practitioner as well as at the Security station of the main entrance to the Project area. If a complaint and/or concern is raised, a formal Incident Investigation will be opened as part of the EMS and managed and investigated in accordance with a fixed operating procedure. A central complaints register will be kept by the Community Development Practitioner and updated and monitored on a monthly basis. Records will be kept of the external complaints, as well as the follow-up investigation and actions taken.

Regular contact will be kept with the complainant until the complaint has been addressed satisfactorily.

11.1.3 Awareness Raising

The communication of the environmental risks for each phase of the Project will take place for the management, administrative and mine worker sectors of the mine. These include:

- Management Sector:
  - A workshop will be conducted to inform all mine management of the risks associated with the mining operation. The risks for all aspects will be explained and the appropriate management options discussed. The workshop will also elaborate on the process of evaluation with regards to data and actions on the mine. The evaluation process is integral in the assurance that the mine reduces any possible environmental risks due to the operation; and
  - The workshop will be conducted prior to the construction phase and will form part of the induction process to ensure that all risks are discussed before there is any chance of the impacts occurring. The workshop may be repeated at certain stages within the life of the Project, in the case of new employees etc.
- Administrative Sector:
  - The communication of the environmental risks to the administrative sector will occur through a workshop or structured courses. This workshop will seek to explain the necessary actions detailed below.
  - Each aspect will be described as well as their significance. Risks associated with each aspect will be discussed to ensure that an understanding of how each action of the Project may impact on the environment;
  - The mitigation of the environmental risk will be elaborated on. It is important that each person understands these management strategies as it ensures that the impact on the environment is kept to a minimum. Data collection regarding each aspect will also be explained to ensure that each aspect is monitored according to those protocols specified by the mine. Along with data collection the reporting of findings will be discussed; and
  - This workshop will take place before the construction phase begins, thus ensuring a full understanding of the Project and its associated environmental risks before any mining activity commence. The course will be repeated at the beginning of the operational phase and the material will be integrated in the induction for new personnel. Various environmental awareness campaigns will be implemented and will be ongoing through the LoM to ensure continuous awareness and training.

- Mine Workers Sector:
  - The mine workers sector will attend a day induction course to ensure that each person is aware of the environmental risks associated with the Project. This induction will form part of the health and safety induction programme for the mine; and
  - This induction course will explain and describe the relevant phases of the Project as well as those environmental risks that may occur during these phases. The environmental risks of each aspect as well as the mitigation will be explained. These workshops will be conducted in English as well as one of the local languages.
- Evaluation of the Environmental Awareness Plan:
  - The evaluation of the Environmental Awareness Plan will be conducted by the management of the mine. This evaluation will entail the auditing of the operation in both the construction and operational phases once activities have commenced. Environmental awareness and issues must form part of the ongoing Environmental, Health and Safety meetings that will be held on a regular basis with different levels of the mine.

11.2 Item 1(m)(2): Manner in which Risks will be dealt with to Avoid Pollution or the Degradation of the Environment

WOC has developed environmental response procedures for environmental disasters and accidents. The procedure describes how emergencies and incidents will be dealt with and recorded. The objective is to ensure that all employees are trained and capable of reacting effectively to emergencies to mitigate the impacts on the environment. The Emergency Response Plan is summarised in Section 4.2.2.

In addition, the mitigation and management measures associated with environmental risks for unplanned events that may arise during the operation of the Project are provided in Table 11-1. It must be noted that the potential impacts as a result of the Project risks have not been rated or assessed in terms of their significance as these are unplanned events.

Table 11-1: Mitigation Measures for Environmental Risks

Unplanned Event	Environmental Aspects	Potential Impact	Mitigation and Management Measures
Hydrocarbon Spillages	Soil and Land Capability	Contamination of soil resources, reducing the land capability of the site.	▪ Hydrocarbons must be stored in bunded and paved areas with a 110% storage capacity; ▪ Hydrocarbon spill kits must be available on site and personnel must undergo spill clean-up training; ▪ The refuelling and changing of oil in vehicles must be undertaken in a designated bunded and/or paved area, and during in-pit fuelling necessary precautions must be taken to reduce and capture any spillages; ▪ Vehicles, equipment and machinery must be serviced as per the designed requirements of the machinery/vehicles; and ▪ Hydrocarbon spills must be contained and cleaned up within 1 day of the incident occurring and reported on to the appropriate manager.
	Surface Water, Groundwater, Wetlands and Aquatic Ecosystems	Contamination of water resources, impacting on water quality. This may impact on downstream users and aquatic ecosystems.	

12 Item 1(n): Specific Information Required by the Competent Authority

The financial provision for the environmental rehabilitation and closure requirements of mining operations is governed by the NEMA which provides, in Section 24P, that the holder of a Mining Right must make financial provision for rehabilitation of negative environmental impacts. The financial revision will be reviewed on an annual basis.

13 Item 2: Undertaking

The EAP herewith confirms:-

2(a) the correctness of the information provided in the reports;

2(b) the inclusion of comments and inputs from stakeholders and I&APs;

2(c) the inclusion of inputs and recommendations from the specialist reports where relevant; and

2(d) the acceptability of the project in relation to the finding of the assessment and level of mitigation proposed.

Signature of the Environmental Assessment Practitioner:	
Name of Company:	Digby Wells and Associates (South Africa) (Pty) Ltd
Date:	August 2016

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Appendix A: Plans

Appendix B: CV and Proof of Qualifications

Appendix C: Public Participation Process

Appendix D: Air Quality Impact Assessment

Appendix E: Soil Impact Assessment

Appendix F: Fauna and Flora Impact Assessment

Appendix G: Aquatics Impact Assessment

Appendix H: Wetlands Impact Assessment

Appendix I: Surface Water Impact Assessment

Appendix J: Groundwater Impact Assessment

Appendix K: Social Impact Assessment

Appendix L: Archaeology Impact Assessment

Appendix M: Rehabilitation Plan and Closure Cost Assessment